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# Applications of Climatology and Meteorology to Hydrologic Simulation

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# APPLICATIONS OF CLIMATOLOGY AND METEOROLOGY TO HYDROLOGIC SIMULATION

Principal Investigators

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# FOREWARD

The primary goal of this investigation was to test hydrometeorological data for suitable probability distributions. The interrelationships between various types of data were investigated also.

In particular, we were concerned with the reliability of records which were collected over variable periods and the ability of selected distributions to synthesize hydrometeorological data. Statistical tests were employed to determine the suitability of the tested data for use in a model which employs the Markov process.

## ABSTRACT

The normal, log-normal, square-root-normal, and cube-root-normal frequency distributions of hydrometeorological data, viz., precipitation, evaporation, and streamflow, were studied for selected regions of Texas. The regions were: East Texas, South Central Texas, and the Low Rolling Plains. These frequency distributions can be used to generate synthetic sequences of hydrometeorological data by simulation techniques of operations research. Results of this research show precipitation data in all regions conform to the square-root-normal distribution; streamflow data conform to the log-normal distribution; and evaporation data conform to all of the frequency distributions tested. Additionally, the streamflow and precipitation data were fitted to the Gumbel extreme-value and to the log-Pearson type III distributions. When monthly series of the data were used, both streamflow and precipitation data fit the log-Pearson type III distribution more adequately than the Gumbel distribution. Monthly series of evaporation data were fitted to the Gumbel distribution only and conform very well.

# ACKNOWLEDGMENTS

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Acknowledgment is extended to the Texas Water Development Board, the U.S. Geological Survey, and the State Climatologist, Environmental Data Service, NOAA, for supplying the data needed in this study.

Much of the work was accomplished by Captain Gary E. O'Connor, a graduate student in meteorology, while on a fellowship from the Institute of Technology, United States Air Force.

TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

LIST OF SYMBOLS

| | |
|---|---|
| $a$ | ratio of expected standard deviation of Gumbel distribution to actual standard deviation of data |
| $E$ | evaporation and evapotranspiration |
| $\|e\|$ | mean deviation |
| $e$ | base of natural logarithm |
| $g$ | Pearson's coefficient of skewness |
| $K$ | Pearson type III coordinates expressed as number of standard deviations from mean |
| $L$ | lag of data in months |
| $L_{MAX}$ | maximum lag in months |
| $m$ | rank of ordered data from the largest to smallest |
| $n$ | sample size, record length, or number of observations |
| $N_x, N_1, N_2, N_3$ | normal annual precipitation for specified station |
| $P$ | precipitation |
| $P_x, P_1, P_2, P_3$ | monthly value of precipitation for specified station |
| $Q$ | computed flood flow for selected recurrence interval or percent change |
| $R$ | runoff |
| $r_L$ | lag-cross correlation coefficient |
| $r$ | cross correlation coefficient |
| $S, S_x, S_y$ | standard deviation |
| $S_n$ | expected standard deviation of Gumbel distribution |
| $\Delta S$ | water stored in hydrologic cycle |
| $S^2$ | variance or second moment about the mean |

| | |
|---|---|
| SE $\gamma_1$ | standard error of skewness |
| SE $\bar{X}$ | standard error of the mean |
| t | "Student's" t value of skewness |
| $T_r$ | return period |
| $T_R$ | theoretical return period of Gumbel distribution |
| $\overline{X_t\ Y_t} - \bar{X}\,\bar{Y}$ | cross-covariance (L = 0) |
| $\overline{X_t\ Y_{t+L}} - \bar{X}\,\bar{Y}$ | cross-covariance (L = 0 to $\pm$ $L_{MAX}$) |
| $X_{MAX}$ | maximum variate value |
| $X_i$ | value of variate |
| $\bar{X}$ | mean or average |
| $X_\ell$ | value of variate adjusted to Gumbel distribution |
| Y | reduced variate of Gumbel distribution |
| $\bar{Y}_n$ | expected mean of Gumbel distribution |
| $\bar{Y}$ | mean |
| Z | cumulative probability that n extremes will be less than $X_i$ |
| $\alpha_1$ | coefficient of variability |
| $\alpha_2$ | relative variability |
| $\gamma_1$ | coefficient of skewness |
| $\gamma_2$ | coefficient of kurtosis |

# CHAPTER I

# INTRODUCTION

## General

The advent of the electronic computer has led to its increased use not only in the analysis of hydrometeorological data but in the application of synthetic hydrology in systems simulation. Synthetic hydrology implies the combination into one complex of factors, ideas, or elements from the entire field of hydrology. When the application includes the manipulation of statistical characteristics, the term "stochastic hydrology" frequently has been applied. Within the context of this study, probability distributions which describe past events and may be applied to the prediction of future conditions will be considered for systems simulation.

Linsley (1951) describes the hydrologic cycle (see Figure 1) which depicts the relationship between atmospheric moisture and surface water. The processes which transfer water from surface to air and from air to surface are, respectively, evaporation and precipitation. The equation defining this balance is

$$R = P - E \pm \Delta S,$$

where P is precipitation, E is evaporation and evapotranspiration, $\Delta S$ is water stored within the cycle, and R is runoff. Determination

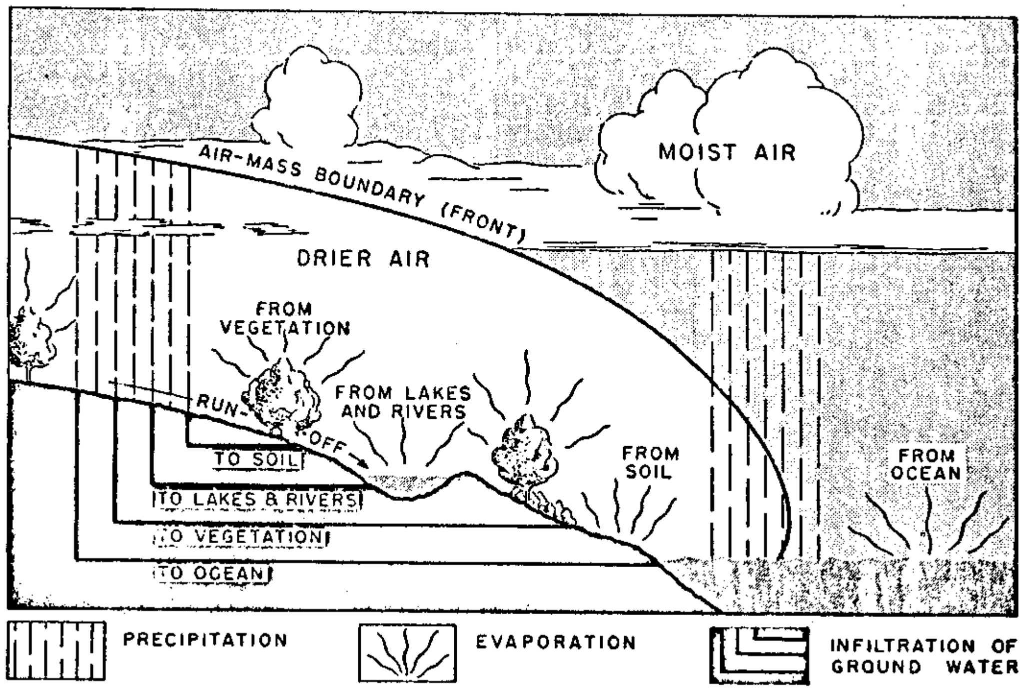


Figure 1. The hydrologic cycle (after Linsley, 1951).

of the spatial and temporal relationships for and between each of these physical processes is vital to the fields of synthetic hydrology and hydrometeorology. The temporal distributions of these parameters have been studied for selected regions in Texas.

There are many sources of statistical information on theoretical frequency distributions and tests to determine whether such parameters as streamflow, precipitation, and evaporation fit these distributions. Panofsky and Brier (1958) discuss the normal distribution and its application in meteorology; Chow (1964) presents a chapter on frequency and correlation analysis of hydrologic data; and Brooks and Carruthers (1953) present both a description of theoretical distributions and a host of statistical tests and tables to determine "goodness-of-fit" of the data to the distributions. Other methods of data analysis, such as Gumbel's (1954) extreme-value frequency analysis and Kohler's (1949) double-mass analysis, are summarized and presented in Bruce and Clark (1966) and Linsley et al. (1958). The log-Pearson type III method of determining flow frequencies is presented by the U. S. Water Resources Council (1967). A study of statistical measures of precipitation variability is given by Longley (1952).

There exist numerous publications which enumerate tests of the fit of hydrometeorological data to various frequency distributions. Stidd (1953) tested the fit of precipitation data to the cube-root-normal distribution and found the data to conform adequately. However, he questioned the extrapolation of the distribution for estimation beyond the period of known data. Several recent studies fitting varied meteorological data to frequency distributions have been completed in the Department of Meteorology at Texas A&M University (e.g., Tucker and Griffiths, 1965; Baker, 1969). Markovic (1965) found that annual precipitation and runoff fit the normal distribution, as well as the more complex distributions of log-normal and gamma with two and three parameters.

Once the theoretical frequency distributions of various hydrological and meteorological parameters have been ascertained, they are used in various synthetic hydrologic models. An overview and critique of present methods of synthetic hydrology is given by Amorocho and Hart (1964). Figure 2, taken from their critique, shows a logical breakdown of the study of the hydrologic cycle and the methods and topics contained within each division. Fiering (1967) makes the point that "typical sample sizes, or record lengths, are insufficient to distinguish between alternate flow populations (for example, normal, lognormal, or gamma)." He also reviewed methods of correlation and lag-correlation of yearly data that are used in synthesis. Other studies on synthetic hydrology have been prepared by Beard (1965, 1967), Beard et al. (1970), Benard (1949), Langbein and Hardison (1955), and Chow and Ramaseshan (1965). Benson and Matalas (1967) state that a knowledge of regional statistical parameters is important in synthesis

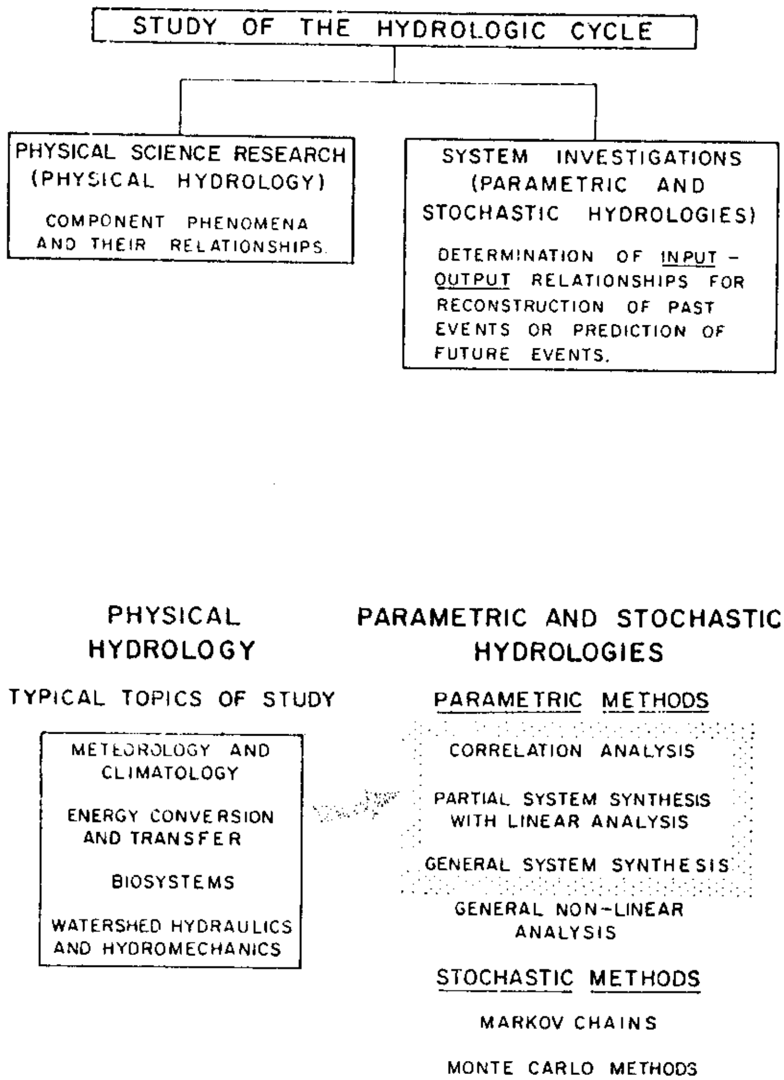


Figure 2. Major divisions of hydrologic study (top), and topics and methods of hydrologic study (bottom) (after Amorocho and Hart, 1964).

of data in regions where no data are available.

A review of publications concerning the analysis of hydrometeorological data reveals the need in synthetic hydrology for statistical information concerning precipitation, evaporation, and streamflow. The completed research should increase the basic knowledge required for continued planning of the water resources of Texas.

## Objectives

The purpose of this study was to investigate the applicability of frequency distributions which can be used to describe the magnitudes of hydrometeorological variables. The variables of primary concern in systems analysis and hydrologic synthesis of Texas water resources are precipitation, evaporation, and streamflow. Other meteorological parameters that are measured and can be related to evaporation and precipitation are temperature and station barometric pressure. Climatological records of these data were used to determine which distributions are applicable.

This research examined the problem of record lengths and the fit of data to probability distributions, as well as the correlations between various parameters. The study of the fit of monthly data attempted to examine the application of the distributions for use in a "monthly operational hydrology generator" discussed by Huffschmidt and Fiering (1966). They generate synthetic sequences based upon a) normally, b) log-normally, c) gamma, or

d) historically distributed flow. Maass _et al_. (1966) base synthesis models upon statistical measures such as correlation, lag-correlation, measures of central tendency, and measures of variability.

The objectives of this research were:

1. to study the application of hydrometeorological data to the field of hydrologic synthesis;
2. to determine significant correlations between selected meteorological variables for various regions of Texas;
3. to fit these data to the following frequency distributions:
   a. normal,
   b. log-normal,
   c. square-root-normal,
   d. cube-root-normal,
   e. Gumbel, and
   f. log-Pearson type III;
4. to test the results by use of various statistical tests; and
5. to determine the number of years of record that must be known in order to obtain the best fit to the various frequency distributions.

A knowledge of the frequency distribution of values of precipitation, evaporation, and streamflow is essential in the selection of risk and design criteria of water resource systems. It also is important in the estimation of missing data and the extrapolation of data for future development. Models for water resource systems and data synthesis, such as the Texas Water Plan (1968), are dependent upon the knowledge provided by frequency distributions of hydrometeorological data.

# CHAPTER II

# HYDROMETEOROLOGICAL DATA

## General

Sources of the data used in this research are the National Oceanic and Atmospheric Administration (N.O.A.A.)*, U. S. Geological Survey, Texas Water Development Board, and Texas Agricultural Experiment Station of Texas A&M University. The climatic regions of the Low Rolling Plains (LRP), East Texas (ET), and the coastal portion of South Central Texas (SCT) were chosen because of their role in the Texas Water Plan (1968). Data used in this study including the climatic region, station name, and period of record used are listed in Table 1. A comparison between the climatic regions and the location of river basins in Texas may be seen from examination of Figures 3 and 4. Figures 5, 6, and 7 are sectional maps of the selected areas to show the relative positions of each station used in this study. Each station selected is identified by a rectangle placed around the station name.

The data chosen for analysis consist of monthly values of:

1. total precipitation in inches,
2. total evaporation in inches (this is gross evaporation, i.e., pan evaporation adjusted by a mean monthly pan coefficient), and

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* Formerly Environmental Data Service (E.S.S.A.).

Table 1. Climatic data used in study.

| Climatic Region | | Station Name | Period of Record |
|---|---|---|---|
| EVAPORATION | | | |
| LRP | | Spur Experiment Sta. | 1919-1968 |
| ET | | Tyler Experiment Sta. | 1933-1967 |
| ET | | Troup Experiment Sta. | 1919-1932 |
| SCT | | Beeville Experiment Sta. | 1919-1968 |
| PRECIPITATION AND TEMPERATURE | | | |
| LRP | | Spur Experiment Sta. | 1919-1968 |
| LRP | | Aspermont W.B. | 1919-1968 |
| LRP | | Munday W.B. | 1919-1968 |
| LRP | | Haskell W.B. | 1919-1968 |
| ET | | Mount Pleasant W.B. | 1919-1968 |
| ET | | Jefferson W.B. | 1919-1968 |
| ET | | Longview W.B. | 1919-1968 |
| SCT | | Beeville Experiment Sta. | 1919-1968 |
| SCT | | Victoria W.B. | 1919-1968 |
| SCT | | Goliad W.B. | 1919-1968 |
| STREAMFLOW | | | |
| LRP | #8-0805 | Double Mtn. Fork Brazos | 1939-1968 |
| LRP | #8-0825 | Brazos R. near Seymour | 1939-1968 |
| ET | #8-0195 | Big Sandy Creek | 1939-1968 |
| ET | #8-0200 | Sabine R. near Gladewater | 1939-1968 |
| SCT | #8-1765 | Guadalupe R. at Victoria | 1939-1968 |
| SCT | #8-1885 | San Antonio R. at Goliad | 1939-1968 |
| STATION PRESSURE | | | |
| LRP | | Abilene W.B. | 1952-1968 |
| ET | | Shreveport W.B. | 1952-1968 |
| SCT | | Victoria W.B. | 1952-1968 |

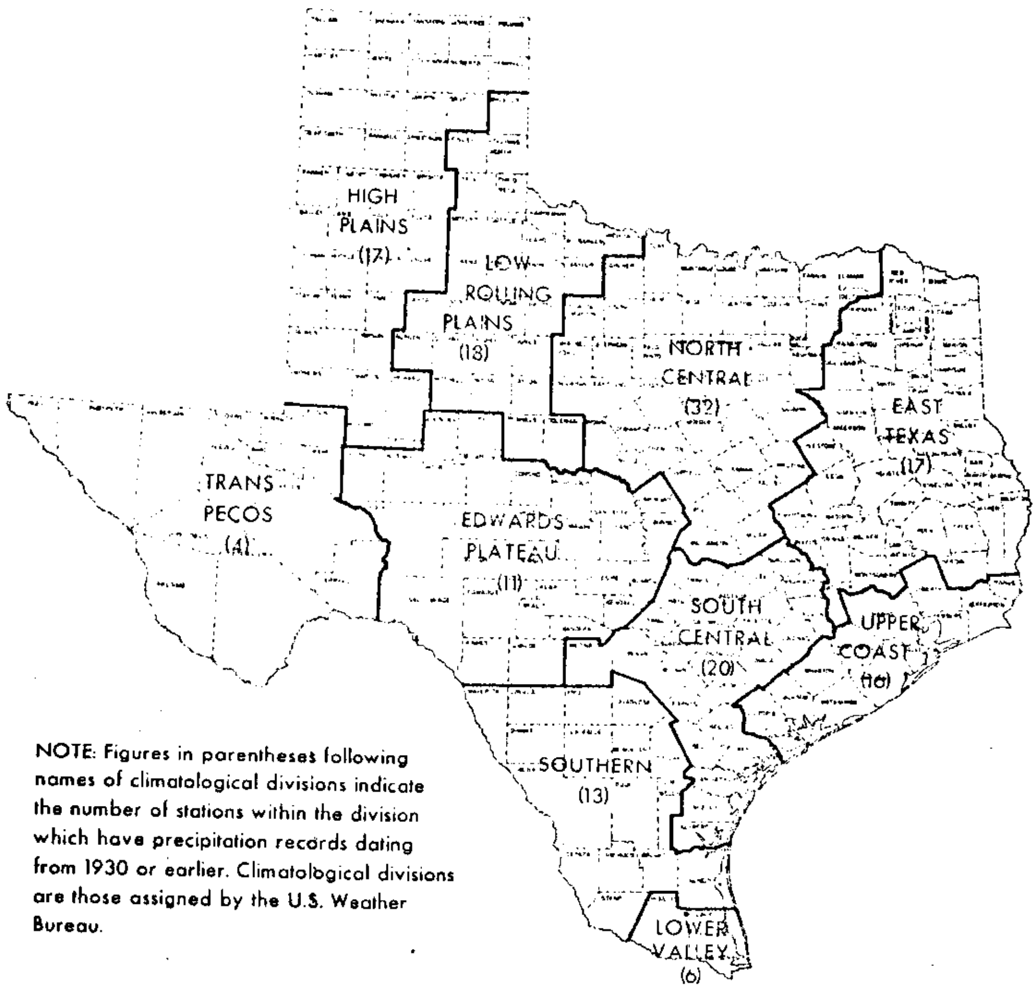


Figure 3. Texas climatological divisions.


Figure 4. Counties and major river and coastal basins in Texas.

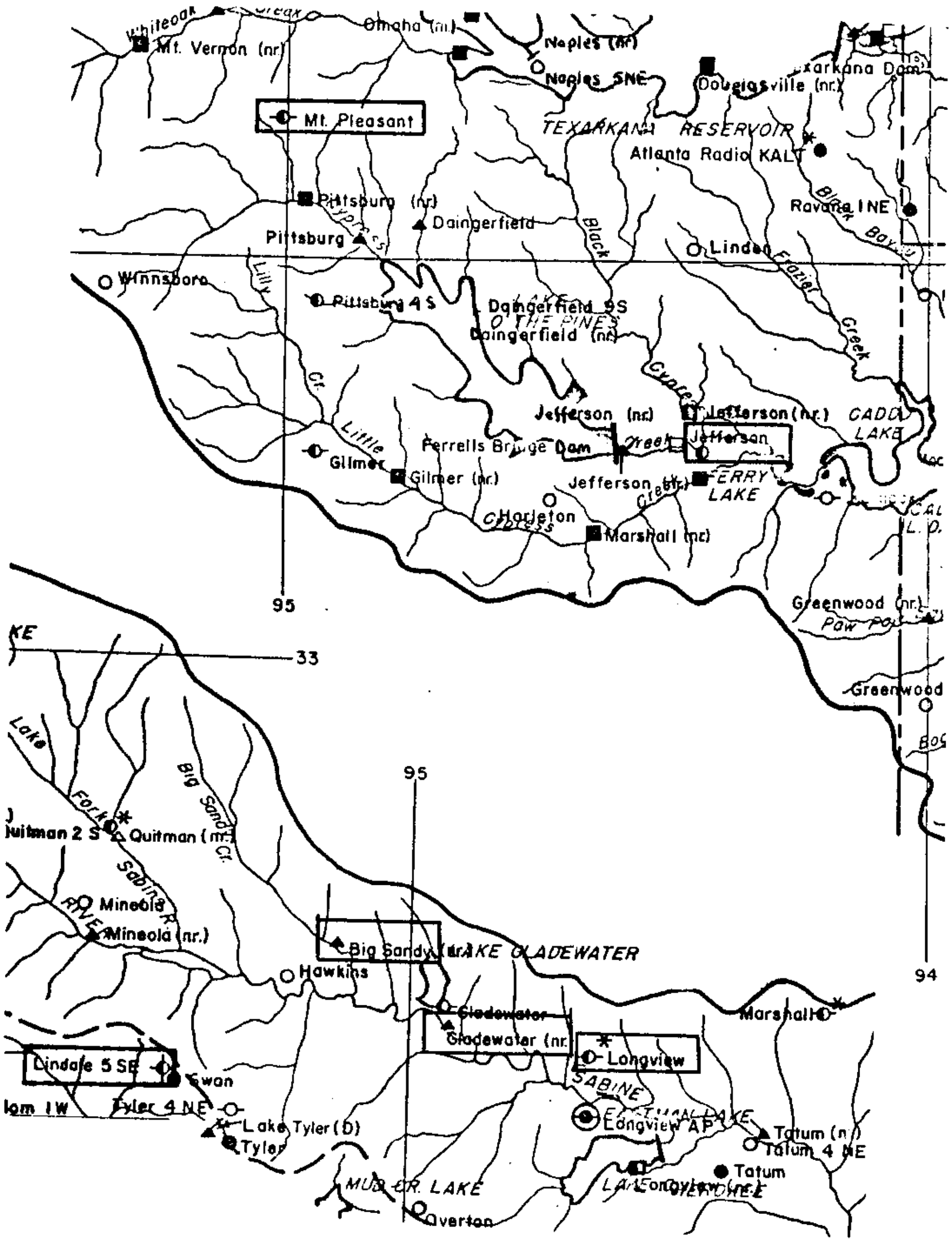


Figure 5. East Texas sectional map (ET).

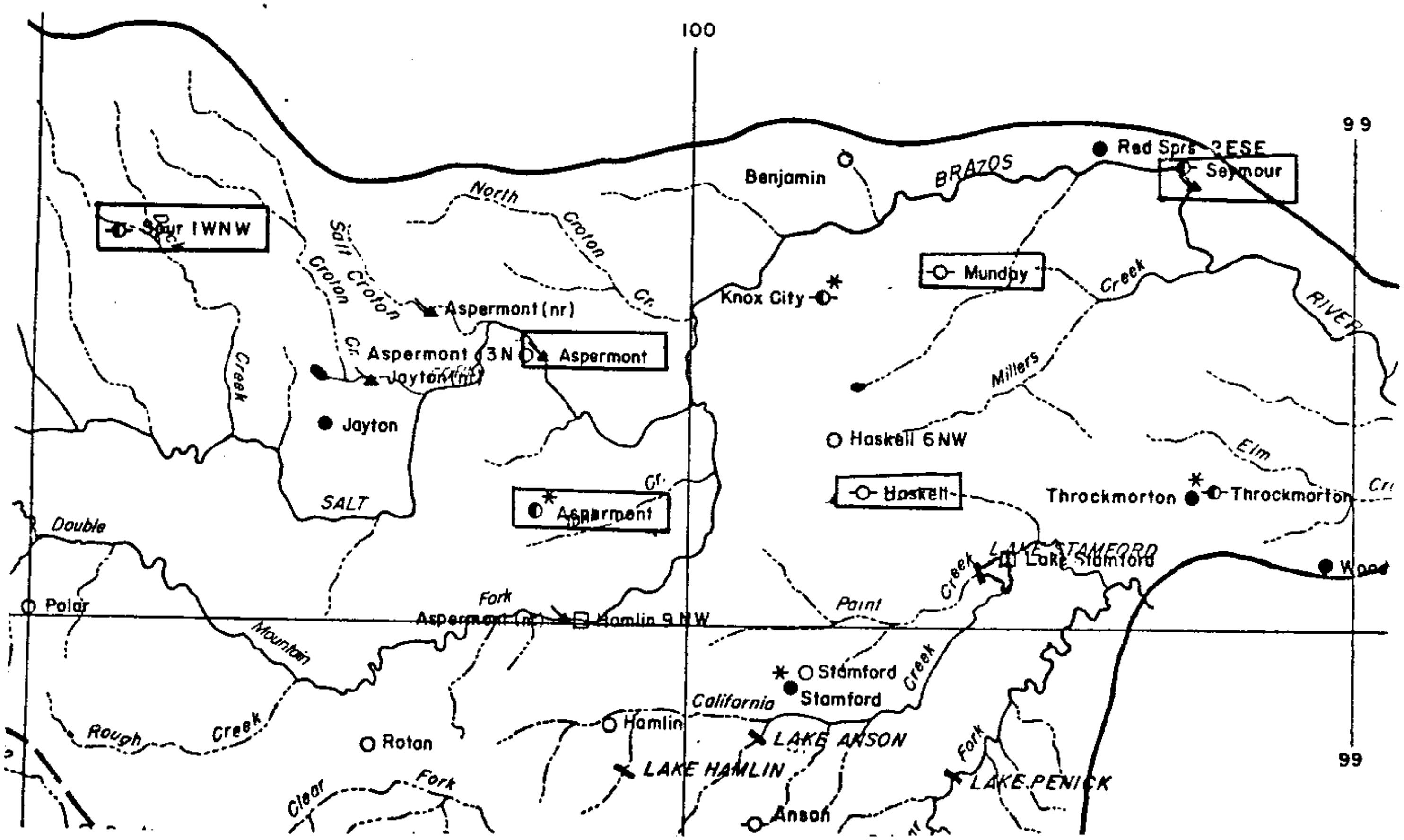


Figure 6. Low Rolling Plains sectional map (LRP).

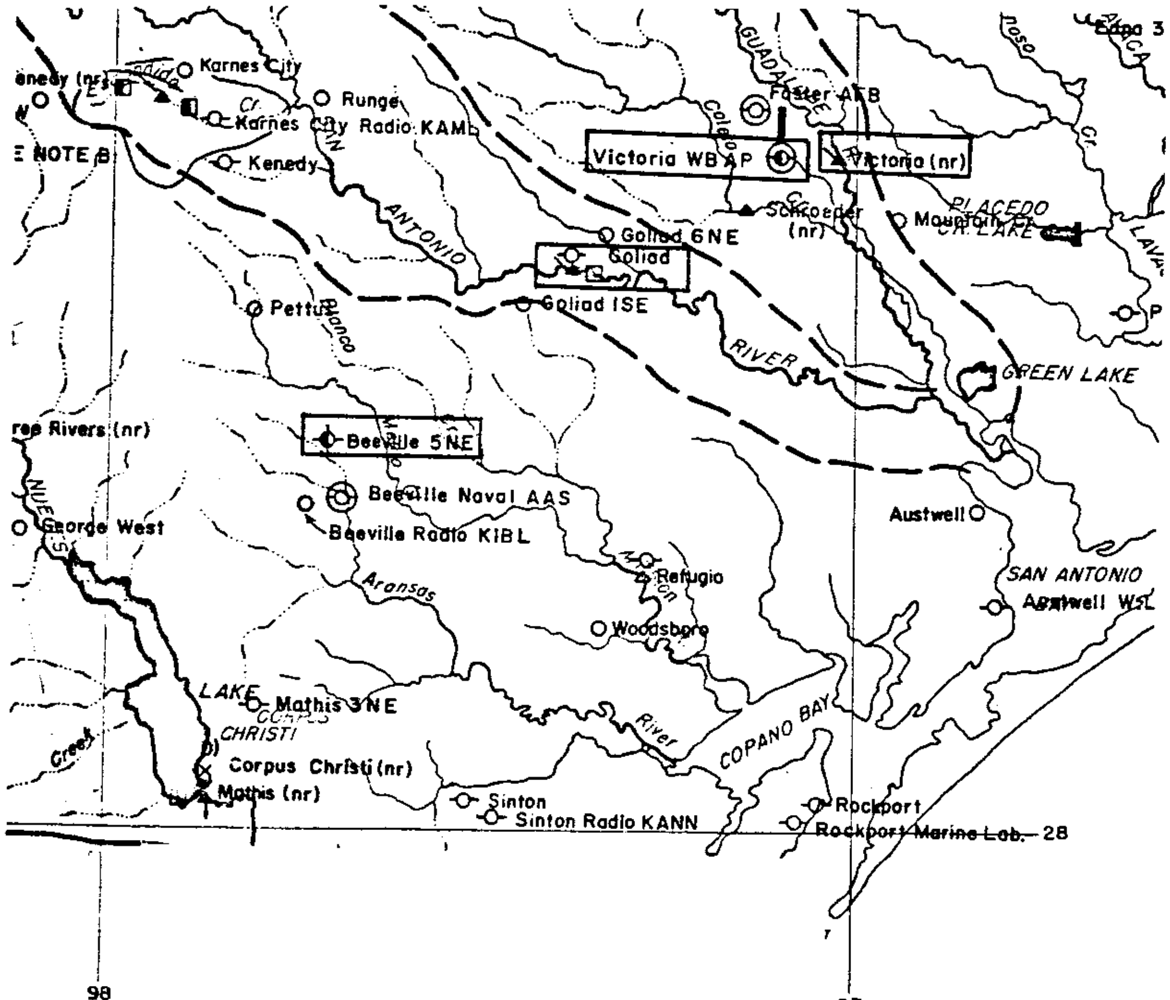


Figure 7. South Central Texas sectional map (SCT).

3. total streamflow expressed in cubic feet per second per day.

All the data were extracted from climatological and hydrological records and punched into computer cards. The evaporation data were adjusted using the mean monthly pan coefficients in Table 2. The coefficients were those of the Texas Water Development Board (1967). Gross evaporation is equal to pan evaporation multiplied by the pan coefficient of the various types of pans. In addition, monthly mean station pressure and temperature were studied to determine if there was any correlation with any of the above parameters.

## Missing Data

The problem of missing data points was handled according to the methods described by Paulhus and Kohler (1952). Of the methods suggested, either the three-station-average or the normal-ratio-method were used.

The equation for the three-station-average is:

$$P_x = \frac{1}{3}(P_1 + P_2 + P_3) , \qquad (1)$$

where $P_x$ is the missing month of record and $P_1$, $P_2$, and $P_3$ are known records of nearby stations for the same month. These stations should be as equally spaced around station x as possible (i.e., located in 60-degree sectors around the station).

Table 2. Mean monthly pan coefficients (after Texas Water Development Board, 1967).

| MONTH | WEATHER BUREAU CLASS A PAN | BUREAU OF PLANT INDUSTRY PAN | YOUNG SCREENED PAN |
|---|---|---|---|
| January | 0.77 | 1.03 | 0.97 |
| February | 0.67 | 0.91 | 0.87 |
| March | 0.64 | 0.78 | 0.81 |
| April | 0.64 | 0.76 | 0.79 |
| May | 0.68 | 0.78 | 0.81 |
| June | 0.73 | 0.85 | 0.91 |
| July | 0.79 | 0.94 | 1.03 |
| August | 0.84 | 1.03 | 1.12 |
| September | 0.88 | 1.11 | 1.19 |
| October | 0.91 | 1.16 | 1.21 |
| November | 0.92 | 1.17 | 1.19 |
| December | 0.89 | 1.12 | 1.10 |

The equation for the normal-ratio-method is:

$$P_x = \frac{1}{3}\left[\left(\frac{N_x}{N_1}\right)P_1 + \left(\frac{N_x}{N_2}\right)P_2 + \left(\frac{N_x}{N_3}\right)P_3\right], \tag{2}$$

where $N_x$, $N_1$, $N_2$, and $N_3$ are the normal annual precipitation, for each station. This provides a weighting factor for the respective index stations. This equation is similar to a least-squares regression equation given as a third method by Paulhus and Kohler (1952). If the normal annual precipitation at either of the three index stations differed by more than 10-percent from the normal of the station having missing monthly data, they suggest that the normal-ratio-method be used. If the normals do not differ more than 10-percent, then the three-station-average should be used. They also state that increasing the number of index stations beyond three does not improve significantly the estimated value.

It was necessary to "fill in" the periods of missing data because correlations and lag-cross correlations cannot be accomplished when there are missing data in an array. McDonald (1957) states that errors in estimation of 25-percent must be expected by using such a method. He remarks, however, that when these errors are compared to the coefficient of variability for station data, the errors are small and such a method of data fill-in is better than ignoring the missing data.

## Errors in Data

Besides the error generated by estimating missing data points, the following errors may or may not exist within the data.

1. Small errors in observation of various meteorological parameters, particularly rainfall, frequently accumulate into larger errors.

2. Instrument error is perhaps the largest encountered and, when all data are considered, can be cumulative.

3. Non-consistent records can exist if there has been a change in station location, observer, or instruments. Kohler (1949) presents the method of double-mass analysis to check the consistency of station records.

In the technique of double-mass analysis the data are for a specific variable and plotted against the average of the sum of the same variable for stations surrounding the one in question. Where there is a break or change in the slope of the curve, it usually indicates that the station has either been moved, the instrument has been changed, or observers have changed. Examination of the station histories and records indicated that an excessive amount of time would be involved in checking all the data used in this study by this procedure and would not be warranted. It was assumed that the data were representative for each station and of the regional meteorology.

# CHAPTER III

# PROCEDURES OF ANALYSIS

## General

The analysis of large amounts of hydrometeorological data was facilitated greatly by the use of the IBM 360/65 computer at Texas A&M University. This machine was used to check all data analyzed, to calculate lag-cross correlations between variables, to correlate between monthly series of precipitation, evaporation, and streamflow data for periods of 15 to 50 yr, to develop statistical parameters, and to perform statistical tests for normality. The monthly data also were ordered from largest to smallest, and the return period ($T_r$) was calculated for a Gumbel (1954) analysis. After performing a log-transform of the data, the mean and standard deviation, along with the return period, were used to fit the data to the log-Pearson type III frequency distribution.

## Statistical Parameters

The sample size was varied from 10 to 50 yr and the data were analyzed by months. The following statistical measures (Brooks and Carruthers, 1953) were calculated from the raw monthly data, from the square-root-transform and cube-root-transform of the monthly data, and from the log-transformation of the monthly data.

1. The mean defined by:

$$\overline{X} = \frac{1}{n} \sum_{i=1}^{n} X_i \quad , \tag{3}$$

where $X_i$ is the value of the variate and n is the sample size,

2. the mean deviation represented by:

$$|e| = \frac{1}{n} \sum_{i=1}^{n} |X_i - \overline{X}| \quad , \tag{4}$$

3. the variance or second moment about the mean given by:

$$S^2 = \frac{1}{n} \sum_{i=1}^{n} (X_i - \overline{X})^2 \quad , \tag{5}$$

4. the standard deviation, defined as the square-root of the second moment or variance and expressed by:

$$S_x = \sqrt{\text{variance}} \quad , \tag{6}$$

5. the coefficient of skewness, $\gamma_1$, defined by:

$$\gamma_1 = \frac{1}{nS_x^3} \sum_{i=1}^{n} (X_i - \overline{X})^3 \quad , \tag{7}$$

6. the coefficient of kurtosis, $\gamma_2$, given by:

$$\gamma_2 = \frac{1}{nS_x^4} \sum_{i=1}^{n} (X_i - \overline{X})^4 \quad , \tag{8}$$

7. the coefficient of variability, expressed by:

$$\alpha_1 = \frac{S_x}{\overline{X}} \quad , \tag{9}$$

8. the relative variability, denoted by:

$$\alpha_2 = \frac{|e|}{\overline{X}} \quad , \tag{10}$$

9. the standard error of skewness, defined by:

$$SE\gamma_1 = \sqrt{(6n)(n-1)/(n-2)(n+1)(n-1)} \quad , \tag{11}$$

10. the standard error of the mean, expressed by:

$$SE\ \overline{X} = \frac{S_x}{\sqrt{n}} \quad . \tag{12}$$

Significance Tests for Normality

Three significance tests for normality were programmed to determine the "goodness of fit" of monthly values of precipitation, evaporation, and streamflow for sample sizes of 10 to 50 yr. The "goodness of fit" was tested for the normal, square-root-normal, cube-root-normal, and log-normal frequency distributions. Conclusive determination of normality cannot be assumed if the data pass the statistical tests. Values for a 5-percent level of confidence were used for all significance tests. If the data fit those values, it was assumed that there is a 95-percent chance that the data are acceptable and a 5-percent chance that the data are unacceptable. Problems involved in this type of data evaluation are to find the data acceptable when they are not (Type II) or to find the data unacceptable when they are valid (TypeI). The statistical tests used were (Brooks and Carruthers, 1953):

1. the Cornu criterion for an infinite sample, defined as:

$$\frac{|e|}{S_x} = \sqrt{2/\pi} = 0.80 \ . \tag{13}$$

Table 3 gives the values of the Cornu criterion for the sample sizes used. Since the values are dependent upon sample size, the acceptable limits decrease as the sample size increases.

Table 3. Cornu criterion (after Brooks and Carruthers, 1953).

| n | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|
| $\frac{\lvert e \rvert}{S_x}$ | .710 to .911 | .728 to .879 | .739 to .864 | .746 to .855 | .751 to .849 |

2. the skewness test is expressed by:

$$t = \frac{\gamma_1}{SE\gamma_1} \quad , \tag{14}$$

where t is the same as "Student's" t values found in Table 4. When t exceeds those values, the distribution is considered excessively skewed and is assumed not to be normal. The values of t are related to the number of degrees of freedom involved in the calculation of $SE\gamma_1$. Values in Table 4 are for n-1 degrees of freedom. For large sample sizes the limiting t value is 1.96.

Table 4. Skewness or "Student's" t values (after Brooks and Carruthers, 1953).

| Degrees of freedom | 9 | 19 | 29 | 39 | 49 |
|---|---|---|---|---|---|
| 95% Value (two tail) | $\pm 2.26$ | $\pm 2.09$ | $\pm 2.04$ | $\pm 2.02$ | $\pm 2.01$ |

3. the Chauvenet criterion is a test on the maximum value of a sample to determine if it is an "outlier" or extreme value. The criterion is determined by:

$$\frac{|X_{MAX} - \overline{X}|}{S_x} \quad . \tag{15}$$

Brooks and Carruthers (1953) state that "given n observations with a standard deviation of S, we can assess the value $\frac{X}{S}$ such that, with a normal distribution, X will be exceeded less frequently than once in 2n observations, i.e., the probability that it will occur once in n times is less than 0.5." Values for the Chauvenet criterion are given below in Table 5.

Table 5. Chauvenet criterion (after Brooks and Carruthers, 1953).

| n | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|
| $\frac{\lvert X_{MAX} - \overline{X}\rvert}{S_x}$ | 1.96 | 2.24 | 2.39 | 2.50 | 2.58 |

The kurtosis test which uses the coefficient of kurtosis divided by the standard error of kurtosis was not used because it is not independent of the Cornu test. Also, the $\chi^2$ test was not used to test the data for normality because of the small sample sizes (maximum of 50). The Cornu and the skewness tests are the more rigorous tests for normality.

## Gumbel Extreme-Value Method

Instead of using the extreme values in an annual series described by Gumbel (1954), the accumulative values for each month, e.g., January for all years, were arranged from the largest to smallest. Each value in the monthly series was assigned a rank from 1 to m. The return period was calculated for each value using

$$T_r = \frac{n+1}{m} \quad , \tag{16}$$

where n is the record length and m is the rank. The maximum monthly value has the largest return period and the minimum monthly value has the smallest return period.

A line for the theoretical Gumbel distribution was found by minimizing the squares of the deviations which are perpendicular to the theoretically expected extreme values. This theoretical line is computed using

$$Y = a\ (X_i - X_\ell) \quad , \tag{17}$$

where

$$a = \frac{S_n}{S_x} , \tag{18}$$

and

$$X_\ell = \overline{X} - S_x \frac{\overline{Y}_n}{S_n} . \tag{19}$$

The quantities $\overline{Y}_n$ and $S_n$ are the expected mean and standard deviation of reduced extremes and are found in Table 6 for record lengths (n) used in this study. Those values are functions of n only. Actual values of the mean and standard deviation are given by $\overline{X}$ and $S_x$, respectively. From Eq. (17), two values of Y were calculated. These two values of Y then were plotted against their respective return period ($T_r$) on extreme probability paper (after Gumbel, 1954), establishing the theoretical line for the return period defined by

$$T_R = \frac{1}{1 - Z} , \tag{20}$$

where

$$Z = e^{-e^{-Y}} . \tag{21}$$

The value e is the base of the natural logarithms.

Table 6. Value of expected mean and standard deviation (after Gumbel, 1954).

| n | $\overline{Y}_n$ | $S_n$ |
|---|---|---|
| 20 | 0.52 | 1.06 |
| 30 | 0.54 | 1.11 |
| 40 | 0.54 | 1.14 |
| 50 | 0.55 | 1.16 |

## Log-Pearson Type III Method

This method also is applied usually to data from an annual series; however, in this study monthly data again were used. The method is as follows:

1. transform the monthly values into logarithms;
2. order the monthly values from largest to smallest and calculate the recurrence interval or return period using Eq. (16);
3. compute the mean and standard deviation of the logarithms using Eqs. (3) and (6), respectively;
4. compute the coefficient of skewness given by

$$g = \frac{n \sum_{i=1}^{n} (X_i - \bar{X})^3}{(n-1)\ (n-2)S^3}\ ; \tag{22}$$

5. compute the logarithms of the variable at selected return periods or percent probability by using

$$\text{Log } Q = X_i + KS\ , \tag{23}$$

   where values of K are obtained from Tables 7 and 8 (after U. S. Water Resources Council, 1967) for computed values of g and for the percent chance selected;
6. the antilog of Q will give the actual values of Q from which the frequency or probability line can be obtained by plotting Q versus $T_r$ or percent chance on log-normal probability paper, or by plotting Log Q versus percent chance on ordinary probability paper and fitting a line to the

Table 7. K values for negative skew coefficients (after U.S. Water Resources Council, 1967).

| Skew Coefficient (g) | Recurrence Interval in Years: 1.0101 | 1.0526 | 1.1111 | 1.2500 | 2 | 5 | 10 | 25 | 50 | 100 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Percent Chance: 99 | 95 | 90 | 80 | 50 | 20 | 10 | 4 | 2 | 1 | 0.5 |
| 0 | -2.326 | -1.645 | -1.282 | -0.842 | 0 | 0.842 | 1.282 | 1.751 | 2.054 | 2.326 | 2.576 |
| - .1 | -2.400 | -1.673 | -1.292 | -0.836 | 0.017 | 0.846 | 1.270 | 1.716 | 2.000 | 2.252 | 2.482 |
| - .2 | -2.472 | -1.700 | -1.301 | -0.830 | 0.033 | 0.850 | 1.258 | 1.680 | 1.945 | 2.178 | 2.388 |
| - .3 | -2.544 | -1.726 | -1.309 | -0.824 | 0.050 | 0.853 | 1.245 | 1.643 | 1.890 | 2.104 | 2.294 |
| - .4 | -2.615 | -1.750 | -1.317 | -0.816 | 0.066 | 0.855 | 1.231 | 1.606 | 1.834 | 2.029 | 2.201 |
| - .5 | -2.686 | -1.774 | -1.323 | -0.808 | 0.083 | 0.856 | 1.216 | 1.567 | 1.777 | 1.955 | 2.108 |
| - .6 | -2.755 | -1.797 | -1.328 | -0.800 | 0.099 | 0.857 | 1.200 | 1.528 | 1.720 | 1.880 | 2.016 |
| - .7 | -2.824 | -1.819 | -1.333 | -0.790 | 0.116 | 0.857 | 1.183 | 1.488 | 1.663 | 1.806 | 1.926 |
| - .8 | -2.891 | -1.839 | -1.336 | -0.780 | 0.132 | 0.856 | 1.166 | 1.448 | 1.606 | 1.733 | 1.837 |
| - .9 | -2.957 | -1.858 | -1.339 | -0.769 | 0.148 | 0.854 | 1.147 | 1.407 | 1.549 | 1.660 | 1.749 |
| -1.0 | -3.022 | -1.877 | -1.340 | -0.758 | 0.164 | 0.852 | 1.128 | 1.366 | 1.492 | 1.588 | 1.664 |
| -1.1 | -3.087 | -1.894 | -1.341 | -0.745 | 0.180 | 0.848 | 1.107 | 1.324 | 1.435 | 1.518 | 1.581 |
| -1.2 | -3.149 | -1.910 | -1.340 | -0.732 | 0.195 | 0.844 | 1.086 | 1.282 | 1.379 | 1.449 | 1.501 |
| -1.3 | -3.211 | -1.925 | -1.339 | -0.719 | 0.210 | 0.838 | 1.064 | 1.240 | 1.324 | 1.383 | 1.424 |
| -1.4 | -3.271 | -1.938 | -1.337 | -0.705 | 0.225 | 0.832 | 1.041 | 1.198 | 1.270 | 1.318 | 1.351 |
| -1.5 | -3.330 | -1.951 | -1.333 | -0.690 | 0.240 | 0.825 | 1.018 | 1.157 | 1.217 | 1.256 | 1.282 |
| -1.6 | -3.388 | -1.962 | -1.329 | -0.675 | 0.254 | 0.817 | 0.994 | 1.116 | 1.166 | 1.197 | 1.216 |
| -1.7 | -3.444 | -1.972 | -1.324 | -0.660 | 0.268 | 0.808 | 0.970 | 1.075 | 1.116 | 1.140 | 1.155 |
| -1.8 | -3.499 | -1.981 | -1.318 | -0.643 | 0.282 | 0.799 | 0.945 | 1.035 | 1.069 | 1.087 | 1.097 |
| -1.9 | -3.553 | -1.989 | -1.310 | -0.627 | 0.294 | 0.788 | 0.920 | 0.996 | 1.023 | 1.037 | 1.044 |
| -2.0 | -3.605 | -1.996 | -1.302 | -0.609 | 0.307 | 0.777 | 0.895 | 0.959 | 0.980 | 0.990 | 0.995 |
| -2.1 | -3.656 | -2.001 | -1.294 | -0.592 | 0.319 | 0.765 | 0.869 | 0.923 | 0.939 | 0.946 | 0.949 |
| -2.2 | -3.705 | -2.006 | -1.284 | -0.574 | 0.330 | 0.752 | 0.844 | 0.888 | 0.900 | 0.905 | 0.907 |
| -2.3 | -3.753 | -2.009 | -1.274 | -0.555 | 0.341 | 0.739 | 0.819 | 0.855 | 0.864 | 0.867 | 0.869 |
| -2.4 | -3.800 | -2.011 | -1.262 | -0.537 | 0.351 | 0.725 | 0.795 | 0.823 | 0.830 | 0.832 | 0.833 |
| -2.5 | -3.845 | -2.012 | -1.250 | -0.518 | 0.360 | 0.711 | 0.771 | 0.793 | 0.798 | 0.799 | 0.800 |
| -2.6 | -3.889 | -2.013 | -1.238 | -0.499 | 0.368 | 0.696 | 0.747 | 0.764 | 0.768 | 0.769 | 0.769 |
| -2.7 | -3.932 | -2.012 | -1.224 | -0.479 | 0.376 | 0.681 | 0.724 | 0.738 | 0.740 | 0.740 | 0.741 |
| -2.8 | -3.973 | -2.010 | -1.210 | -0.460 | 0.384 | 0.666 | 0.702 | 0.712 | 0.714 | 0.714 | 0.714 |
| -2.9 | -4.013 | -2.007 | -1.195 | -0.440 | 0.390 | 0.651 | 0.681 | 0.683 | 0.689 | 0.690 | 0.690 |
| -3.0 | -4.051 | -2.003 | -1.180 | -0.420 | 0.396 | 0.636 | 0.660 | 0.666 | 0.666 | 0.667 | 0.667 |

Table 8. K values for positive skew coefficients (after U.S. Water Resources Council, 1967).

| Skew Coefficient (g) | Recurrence Interval in Years: 1.0101 | 1.0526 | 1.1111 | 1.2500 | 2 | 5 | 10 | 25 | 50 | 100 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Percent Chance | 99 | 95 | 90 | 80 | 50 | 20 | 10 | 4 | 2 | 1 | 0.5 |
| 3.0 | -0.667 | -0.665 | -0.660 | -0.636 | -0.396 | 0.420 | 1.180 | 2.278 | 3.152 | 4.051 | 4.970 |
| 2.9 | -0.690 | -0.688 | -0.681 | -0.651 | -0.390 | 0.440 | 1.195 | 2.277 | 3.134 | 4.013 | 4.909 |
| 2.8 | -0.714 | -0.711 | -0.702 | -0.666 | -0.384 | 0.460 | 1.210 | 2.275 | 3.114 | 3.973 | 4.847 |
| 2.7 | -0.740 | -0.736 | -0.724 | -0.681 | -0.376 | 0.479 | 1.224 | 2.272 | 3.093 | 3.932 | 4.783 |
| 2.6 | -0.769 | -0.762 | -0.747 | -0.696 | -0.368 | 0.499 | 1.238 | 2.267 | 3.071 | 3.889 | 4.718 |
| 2.5 | -0.799 | -0.790 | -0.771 | -0.711 | -0.360 | 0.518 | 1.250 | 2.262 | 3.048 | 3.845 | 4.652 |
| 2.4 | -0.832 | -0.819 | -0.795 | -0.725 | -0.351 | 0.537 | 1.262 | 2.256 | 3.023 | 3.800 | 4.584 |
| 2.3 | -0.867 | -0.850 | -0.819 | -0.739 | -0.341 | 0.555 | 1.274 | 2.248 | 2.997 | 3.753 | 4.515 |
| 2.2 | -0.905 | -0.882 | -0.844 | -0.752 | -0.330 | 0.574 | 1.284 | 2.240 | 2.970 | 3.705 | 4.444 |
| 2.1 | -0.946 | -0.914 | -0.869 | -0.765 | -0.319 | 0.592 | 1.294 | 2.230 | 2.942 | 3.656 | 4.372 |
| 2.0 | -0.990 | -0.949 | -0.895 | -0.777 | -0.307 | 0.609 | 1.302 | 2.219 | 2.912 | 3.605 | 4.298 |
| 1.9 | -1.037 | -0.984 | -0.920 | -0.788 | -0.294 | 0.627 | 1.310 | 2.207 | 2.881 | 3.553 | 4.223 |
| 1.8 | -1.087 | -1.020 | -0.945 | -0.799 | -0.282 | 0.643 | 1.318 | 2.193 | 2.848 | 3.499 | 4.147 |
| 1.7 | -1.140 | -1.056 | -0.970 | -0.808 | -0.268 | 0.660 | 1.324 | 2.179 | 2.815 | 3.444 | 4.069 |
| 1.6 | -1.197 | -1.093 | -0.994 | -0.817 | -0.254 | 0.675 | 1.329 | 2.163 | 2.780 | 3.388 | 3.990 |
| 1.5 | -1.256 | -1.131 | -1.018 | -0.825 | -0.240 | 0.690 | 1.333 | 2.146 | 2.743 | 3.330 | 3.910 |
| 1.4 | -1.318 | -1.168 | -1.041 | -0.832 | -0.225 | 0.705 | 1.337 | 2.128 | 2.706 | 3.271 | 3.828 |
| 1.3 | -1.383 | -1.206 | -1.064 | -0.838 | -0.210 | 0.719 | 1.339 | 2.108 | 2.666 | 3.211 | 3.745 |
| 1.2 | -1.449 | -1.243 | -1.086 | -0.844 | -0.195 | 0.732 | 1.340 | 2.087 | 2.626 | 3.149 | 3.661 |
| 1.1 | -1.518 | -1.280 | -1.107 | -0.848 | -0.180 | 0.745 | 1.341 | 2.066 | 2.585 | 3.087 | 3.575 |
| 1.0 | -1.588 | -1.317 | -1.128 | -0.852 | -0.164 | 0.758 | 1.340 | 2.043 | 2.542 | 3.022 | 3.489 |
| .9 | -1.660 | -1.353 | -1.147 | -0.854 | -0.148 | 0.769 | 1.339 | 2.018 | 2.498 | 2.957 | 3.401 |
| .8 | -1.733 | -1.388 | -1.166 | -0.856 | -0.132 | 0.780 | 1.336 | 1.993 | 2.453 | 2.891 | 3.312 |
| .7 | -1.806 | -1.423 | -1.183 | -0.857 | -0.116 | 0.790 | 1.333 | 1.967 | 2.407 | 2.824 | 3.223 |
| .6 | -1.880 | -1.458 | -1.200 | -0.857 | -0.099 | 0.800 | 1.328 | 1.939 | 2.359 | 2.755 | 3.132 |
| .5 | -1.955 | -1.491 | -1.216 | -0.856 | -0.083 | 0.808 | 1.323 | 1.910 | 2.311 | 2.686 | 3.041 |
| .4 | -2.029 | -1.524 | -1.231 | -0.855 | -0.066 | 0.816 | 1.317 | 1.880 | 2.261 | 2.615 | 2.949 |
| .3 | -2.104 | -1.555 | -1.245 | -0.853 | -0.050 | 0.824 | 1.309 | 1.849 | 2.211 | 2.544 | 2.856 |
| .2 | -2.178 | -1.586 | -1.258 | -0.850 | -0.033 | 0.830 | 1.301 | 1.818 | 2.159 | 2.472 | 2.763 |
| .1 | -2.252 | -1.616 | -1.270 | -0.846 | -0.017 | 0.836 | 1.292 | 1.785 | 2.107 | 2.400 | 2.670 |
| 0 | -2.326 | -1.645 | -1.282 | -0.842 | 0 | C.842 | 1.282 | 1.751 | 2.054 | 2.326 | 2.576 |

points.

The log-Pearson method usually is applied only to flood frequency analyses but was tested on distributions of precipitation.

## Correlation Analyses

The following equation from Panofsky and Brier (1958) was used in the correlation analyses,

$$r_L = \frac{\overline{X_t Y_{t+L}} - \overline{X}\ \overline{Y}}{S_x S_y} \quad . \tag{24}$$

This equation represents a lag-cross correlation, where L is the lag in months and $\overline{X_t Y_{t+L}} - \overline{X}\ \overline{Y}$ is the cross-covariance. If n observations are studied, there will be n-L terms in each lag-cross correlation, where L can vary from 0 to $\pm L_{MAX}$. The lag, $L_{MAX}$, chosen was 10 to 15 percent of the number of data points (where 288 data points were used, $L_{MAX} \doteq \pm 34$). $\overline{X}$ and $\overline{Y}$ were computed from Eq. 3 and $S_x$ and $S_y$ using Eqs. 5 and 6. The mean and standard deviation were calculated from n data points and were assumed not to vary as the data were lagged. The purpose of such an analysis is to determine any possible temporal relationship among the variables and the possibility of any physical interrelations that may by cyclic in nature.

Eq. 24 in the following form,

$$r = \frac{\overline{X_t Y_t} - \overline{X}\ \overline{Y}}{S_x\ S_y} \quad , \tag{25}$$

was used to calculate the intercorrelation between months. This procedure tested the relationship between January and February, February and March, etc., for precipitation, evaporation, and streamflow. A period record of 25 and 50 yr was used on precipitation and evaporation, and a period of 15 and 30 yr for streamflow. This was done to determine if there were any physical relationships between months.

# CHAPTER IV

# RESULTS

## Fit of Data to Probability Distributions

Tables 9, 10, 11, and 12 show the results of fitting precipitation, evaporation, and streamflow to the normal, square-root-normal, cube-root-normal, and log-normal distributions. In these analyses the first 10 yr of data was analyzed then an additional 10 years added until the total period of record was included. In the tables an "X" indicates that the data fit for all time periods used. A "+" indicates that only the first 10 yr of data failed to fit the distribution and the data normalize for periods of 20 to 50 yr. Data marked with either of those symbols are assumed normal, where normality was concluded if, and only if, the data passed both the Cornu and skewness tests. A detailed breakdown of the "goodness of fit" as tested by the Cornu, skewness, and Chauvenet tests is found in Appendix A.

The monthly evaporation data for the Tyler and Spur Experiment Stations, respectively, fit the normal distribution 75 and 67-percent of all months. Table 9, also shows that both monthly precipitation and monthly streamflow do not fit the normal distribution.

The square-root-transform of the data significantly improved its normality, Table 10. The percentage of evaporation data

Table 9. Results of data fit to the normal frequency distribution.

NORMAL DISTRIBUTION

| MONTH / STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | | | | | | | | | | | | |
| Beeville | | | | | | X | | | | | | |
| Goliad | | | | | | | | | | | | |
| Jefferson | | | | | | | | | | | | |
| Longview | X | + | | | | | | | | | | |
| Mt.Pleas. | | | | | | | | X | | | | X |
| Munday | | | | | | | | | | | | |
| Haskel | | | | | X | | | | | | | |
| Spur | | | | | | X | | | | | | |
| Aspermont | | | | | | | | | | | | |
| Spur (E) | X | X | | | | | | | | | | |
| Tyler (E) | X | | X | | X | X | | X | X | X | + | X |
| Beeville(E) | + | | X | X | X | | | X | X | | X | X |
| Double Mtn | | | | | | | | | | | | |
| Brazos | | | | | | | | | | | | |
| Big Sandy | | | | | | | | | | | | |
| Sabine | | | | | | | | | X | | | |
| Guadalupe | | | | | | | | | | | | |
| S. Antonio | | | | | | | | | | | | |

X-all data fit; + -first 10 yr of data do not fit.

Table 10. Results of data fit to the square-root-normal frequency distribution.

SQUARE-ROOT-NORMAL DISTRIBUTION

| MONTH / STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | | + | | X | | + | X | | | X | X | X |
| Beeville | | X | X | X | X | + | X | X | | X | X | X |
| Goliad | | X | | X | | + | X | X | | X | X | X |
| Jefferson | X | X | X | | X | + | + | X | X | X | X | X |
| Longview | X | | X | X | X | X | X | + | | | X | |
| Mt.Pleas. | X | | | | | X | X | X | X | | X | X |
| Munday | | X | X | X | X | X | X | X | X | X | X | X |
| Haskel | X | X | | X | X | X | X | | X | X | X | X |
| Spur | | X | X | X | X | | X | | X | X | X | X |
| Aspermont | X | X | X | X | X | X | X | | X | X | | + |
| Spur (E) | X | X | | | X | | | X | X | | X | X |
| Tyler (E) | X | | | | X | | | X | X | X | + | X |
| Beeville(E) | X | X | X | X | X | | | X | X | | X | X |
| Double Mtn | | | | | | X | X | X | | | | |
| Brazos | | | | | | X | X | | | | | X |
| Big Sandy | X | | | | X | | X | X | X | | | X |
| Sabine | X | | | | X | X | | | X | | | X |
| Guadalupe | | | X | X | | X | | X | | | | |
| S. Antonio | | | X | | | X | | X | | | | |

X -all data fit; + -first 10 yr of data do not fit.

Table 11. Results of data fit to the cube-root-normal distribution.

CUBE-ROOT-NORMAL DISTRIBUTION

| MONTH / STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | X | + | | X | + | | X | | | X | X | X |
| Beeville | X | + | X | X | X | | X | X | | X | X | X |
| Goliad | | X | | X | | | X | X | + | X | X | X |
| Jefferson | X | | X | | X | X | | X | | X | X | X |
| Longview | X | | X | X | | X | X | X | | | X | |
| Mt.Pleas. | X | | | X | X | X | X | | | | X | X |
| Munday | X | X | | X | X | X | X | | X | X | | + |
| Haskel | X | X | | + | X | | X | | X | | X | + |
| Spur | X | X | X | X | X | | | | X | | X | X |
| Aspermont | X | X | X | X | | X | X | | X | | X | + |
| Spur (E) | X | X | | | X | | X | X | + | | X | X |
| Tyler (E) | X | | | | + | | | X | X | X | + | X |
| Beeville(E | | X | X | X | X | | | X | X | | X | X |
| Double Mtn | | | | | + | X | X | X | X | X | X | |
| Brazos | | X | | | | X | X | + | X | X | X | X |
| Big Sandy | X | X | | X | X | X | X | X | X | | | X |
| Sabine | | | X | | X | X | X | X | X | | | X |
| Guadalupe | + | | X | X | | X | | X | + | | X | X |
| S. António | | | | | X | X | | X | | | | |

X -all data fit; + -first 10 yr of data do not fit.

Table 12. Results of data fit to the log-normal frequency distribution.

LOG-NORMAL DISTRIBUTION

| MONTH / STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | X | | | X | X | | X | | | | | |
| Beeville | X | | | | | | | | | | | |
| Goliad | X | | X | X | X | | | | | | | |
| Jefferson | X | | | | | | | | | | | |
| Longview | | | X | X | | | | | | | | |
| Mt.Pleas. | X | | | X | X | | | | | | | |
| Munday | | | | | X | | | | | | | |
| Haskel | | | | | | | | | | | | |
| Spur | | | | | | | | | | | | + |
| Aspermont | | | | | | | | | | | | |
| Spur (E) | X | X | | | X | + | X | X | + | | X | X |
| Tyler (E) | X | | | | + | | | X | X | X | + | X |
| Beeville(E | | X | X | + | X | | | X | X | | X | X |
| Double Mtn | | X | X | X | X | X | X | | X | X | | |
| Brazos | | X | | X | X | X | | | X | X | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | X |
| Sabine | | X | X | X | X | X | X | X | X | X | X | X |
| Guadalupe | X | X | X | X | X | X | X | | + | X | | X |
| S. Antonio | | X | X | | X | X | X | X | | X | X | X |

X -all data fit; + -first 10 yr of data do not fit.

fitting the distribution remained essentially unchanged, except for an improvement in the data for Spur. The greatest improvement was in the precipitation data. The LRP stations show the best results, where more than 75-percent of the monthly records fit the square-root-normal distribution. The streamflow data also show a marked improvement, but still less than 50-percent of the streamflow data fit the square-root-normal distribution. In general, both monthly precipitation and evaporation data for the LRP, ET, and SCT regions fit the square-root-normal frequency distribution.

The cube-root-normal distribution produced results similar to the square-root-normal distribution for both precipitation and evaporation data. Results in Table 11 indicate that there was significant improvement in the streamflow data where more than 58-percent of the data fit the cube-root-normal distribution.

Table 12 shows that a drastic deterioration of the precipitation data occurs when the log-transform is made. Again, there is relatively little change in the results for the evaporation data where more than 55-percent of the evaporation data fit the log-normal distribution. The logarithms of the streamflow data fit the normal distribution greater than 75-percent of the time for the ET and SCT regions. The streamflow data for the LRP region show an improvement over the square-root and cube-root transforms but not as significant as for the other two regions. For the log-normal distribution, the evaporation and streamflow data show a better fit than the precipitation data.

The problem of the length of record or sample size was not resolved completely by this study. In some cases, the data did not fit any distribution no matter how many years of record were used. Results are presented in Appendix B for sliding periods of record beginning with the first 10 yr, first 20 yr, and first 30 yr. These periods are then moved to include contiguous periods of selected length. Examination of the analyses presented in both Appendices A and B indicate that there are many instances where the data are normal for different time periods. An example is the June precipitation at Haskell. In this case it is normal for all 10- and 20-yr periods of record but is not normal for one 30-yr period or the 40-yr period; however, it is again normal for a 50-yr period. It also is interesting to note that very few of the precipitation station data fit the normal distribution when the period of record exceeds 20 yr; however, most of the 10- and 20-yr periods of data gave satisfactory results. This and other examples emphasize the need for a comprehensive study of all the years of record that are available before deciding which frequency distribution should be used. In many cases, the Cornu and skewness tests failed because there was an excessively high value or "outlier" in the data. This is why several stations in Tables 9, 10, 11, and 12 have months marked with a "+"; an extremely high value in the first 10 yr of data frequently made the data non-normal. Subsequent years of data proved that this high value was not an "outlier," and the distribution then passed the statistical tests for normality.

## Correlation Analyses

Intercorrelations. The monthly intercorrelation of the data utilized Eq. (25); however, the results were not favorable. In this case, only data for specific monthly periods were used. There were no significant intercorrelations when record lengths were varied; the correlations were not consistent. Examples are: for the Guadalupe River the correlation between June and July for a 15-yr record is 0.67 and for 30 yr it is 0.19; for the Brazos River the correlation between May and June for a 15-yr record is -0.14 and for 30 yr it is 0.30. For precipitation data, the monthly intercorrelations were very small ranging between $\pm 0.30$. The evaporation data offered better results in that there were some months which showed a consistent correlation. Especially consistent were the months of June, July and August, months in which the temperatures are warm. Examples of the intercorrelations for the evaporation data are: Tyler Experiment Station, July to August, 0.75; Beeville Experiment Station, June to July, 0.58, and July to August, 0.63. These values remained constant (i.e., they varied $\pm 0.05$ for record lengths of 25 to 50 yr).

Lag-correlation. The following data showed no significant lag-cross correlations;

a. Streamflow when correlated with mean, maximum, or minimum temperature;

b. precipitation correlated with mean, maximum, or minimum temperature;

c. station pressure correlated with precipitation or streamflow;

d. streamflow correlated with evaporation; and

e. precipitation correlated with evaporation.

An expected result was the high correlation and cyclic trend between temperature and evaporation. Figure 8 shows this high correlation for Beeville Experiment Station. Note, however, that the curve is not symmetric with respect to lag zero. For $L = -1$, there is a high correlation, which is interpreted as the effect of the temperature for the previous month on the evaporation of this month. Figure 9 also shows a cyclic trend but a negative correlation between station pressure and evaporation. In this case the curve demonstrates that evaporation and station-pressure distributions are out of phase with each other. The effect of warm temperatures creating lower pressure and causing increased evaporation, and the effect of cold temperatures creating higher pressure and causing a decrease in evaporation is demonstrated by this curve. The lag-cross correlation between evaporation at Beeville Experiment Station and evaporation at Tyler Experiment Station, Figure 10, was completely symmetrical. This simply indicates the high correlation between evaporation stations and their annual cyclic character.

Values of correlation for $L = 0$ between precipitation and streamflow for all stations varied between 0.60 and 0.80. Figure 11 shows average correlations for the regions used in this study. Again, the results show an effect of the meteorological variables in time.

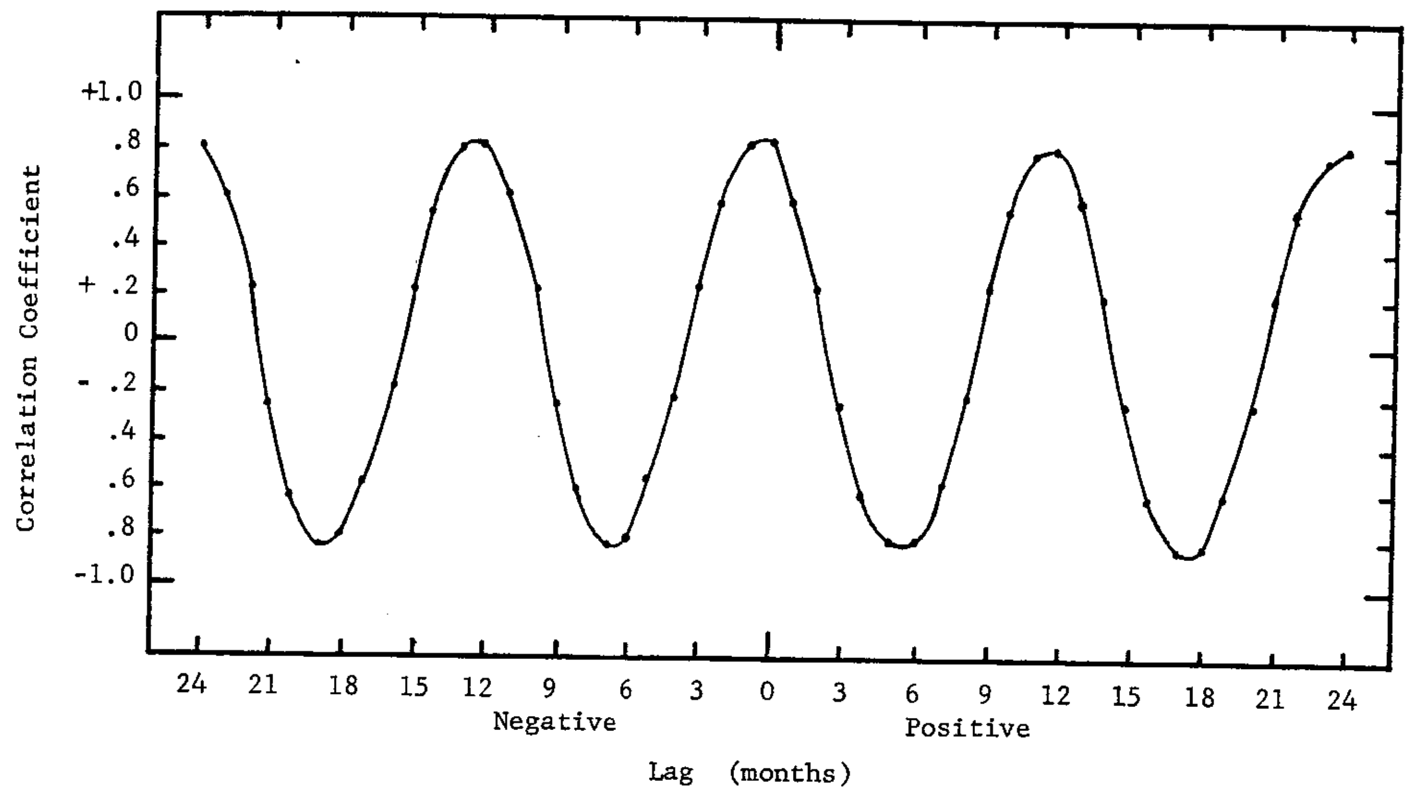


Figure 8. Lag-cross correlation of evaporation vs. mean temperature for Beeville Experiment Station (SCT).

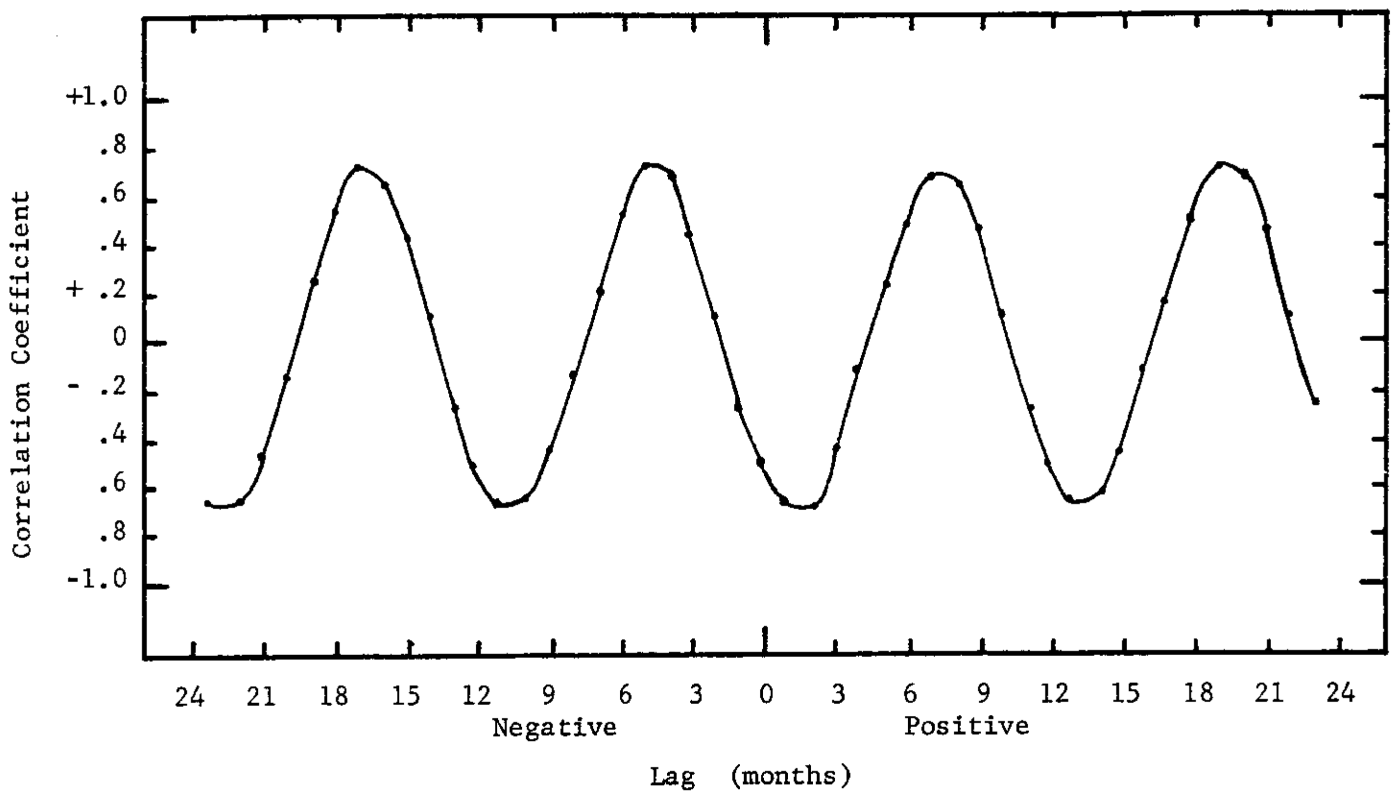


Figure 9. Lag-cross correlation of evaporation vs. station pressure for Victoria (SCT).

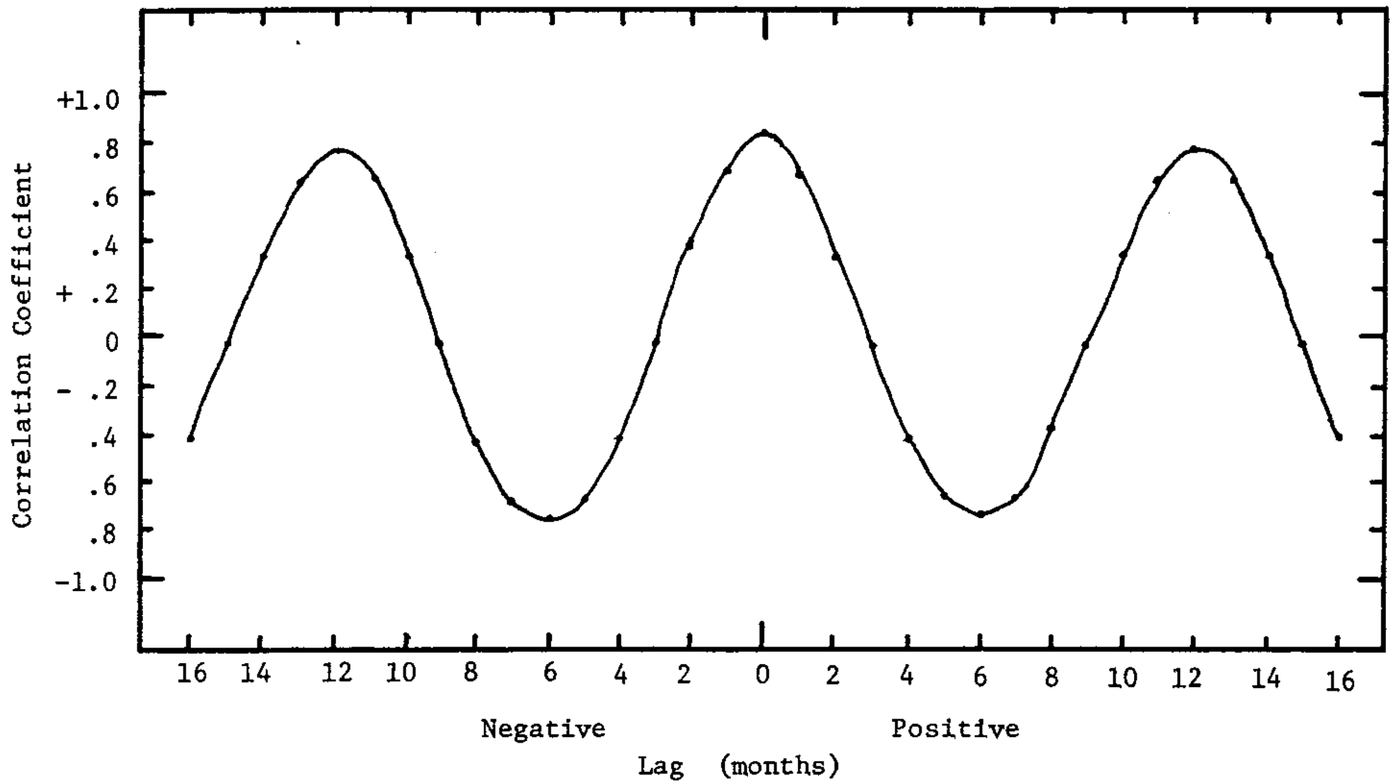


Figure 10. Lag-cross correlation of evaporation at Beeville Experiment Station (SCT) vs. evaporation at Tyler Experiment Station (ET).

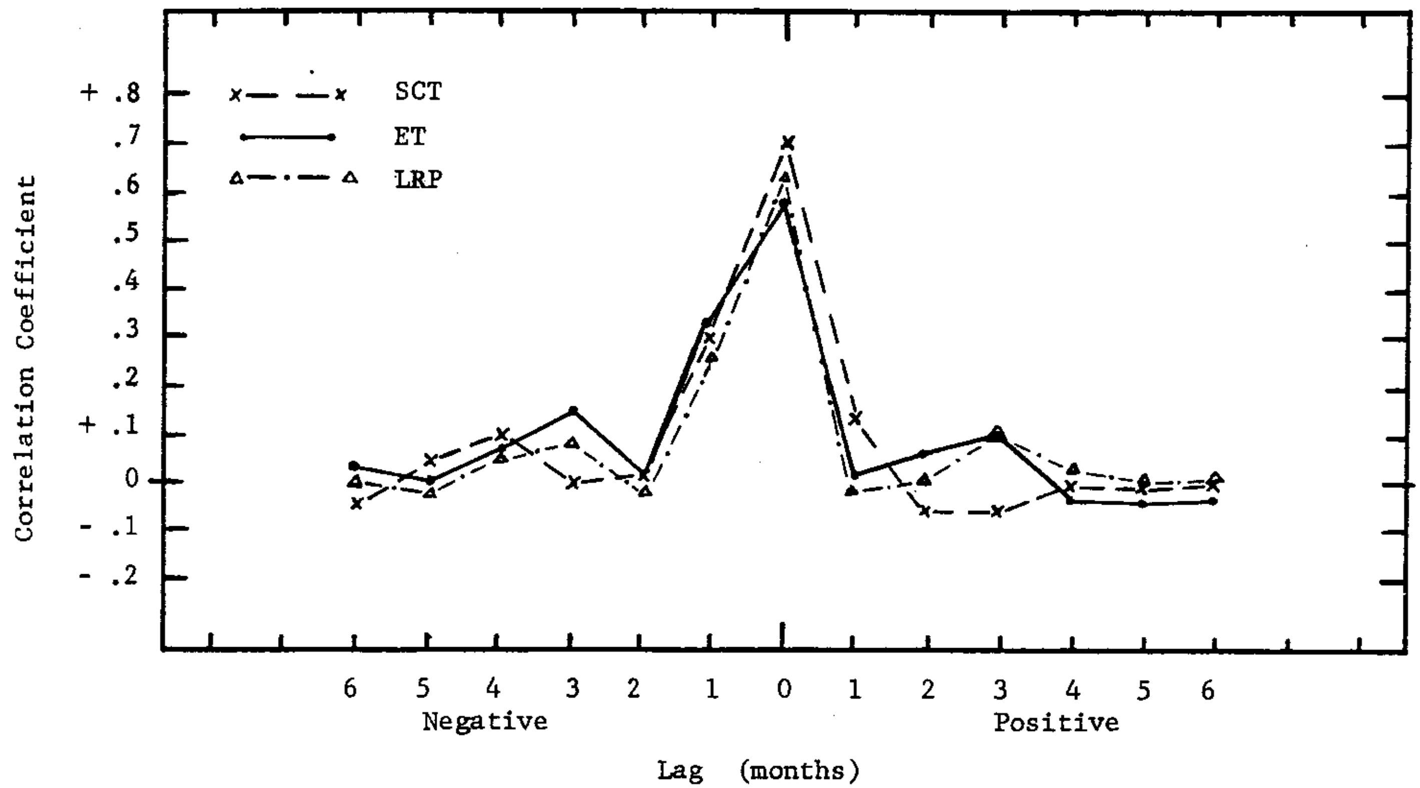


Figure 11. Lag-cross correlation of streamflow vs. precipitation for various regions.

For L = -1, interpreted as the precipitation of the previous month affects the streamflow of the present month, the coefficient of correlation is roughly 0.2. Positive lag has no physical meaning because it is the effect of next month's precipitation on this month's streamflow. Lag-cross correlations of streamflow vs streamflow and precipitation vs precipitation for stations within each of the selected regions, Figures 12, 13, 14, and 15, show practically no correlation except for L = 0. Only L = $\pm 1$ for streamflow showed any real correlation. This demonstrates the independence of rainfall events, but indicates the effects of base flow in runoff determination.

Effective precipitation (EP) is defined as monthly precipitation less evaporation and in most cases is a negative quantity. The converse is net evaporation which is monthly evaporation less precipitation. The correlation between temperature and EP was largely negative and just the inverse of the curve for temperature versus evaporation (Figure 8). A rather significant result was obtained when EP was correlated with streamflow. For the ET and SCT regions there was no significant change in the correlation between EP versus streamflow or precipitation versus streamflow. An example for the SCT region is shown in Figure 16. However, in the LRP region of Texas, there was a significant decrease in the correlation when EP was used. This is demonstrated in Figure 17 for Aspermont correlated with the Double-Mountain Fork of the Brazos River. For precipitation versus streamflow the correlation is roughly 0.68, while for EP versus streamflow the correlation is roughly 0.22. This apparently is due to a climatic difference between the regions of ET and SCT and the

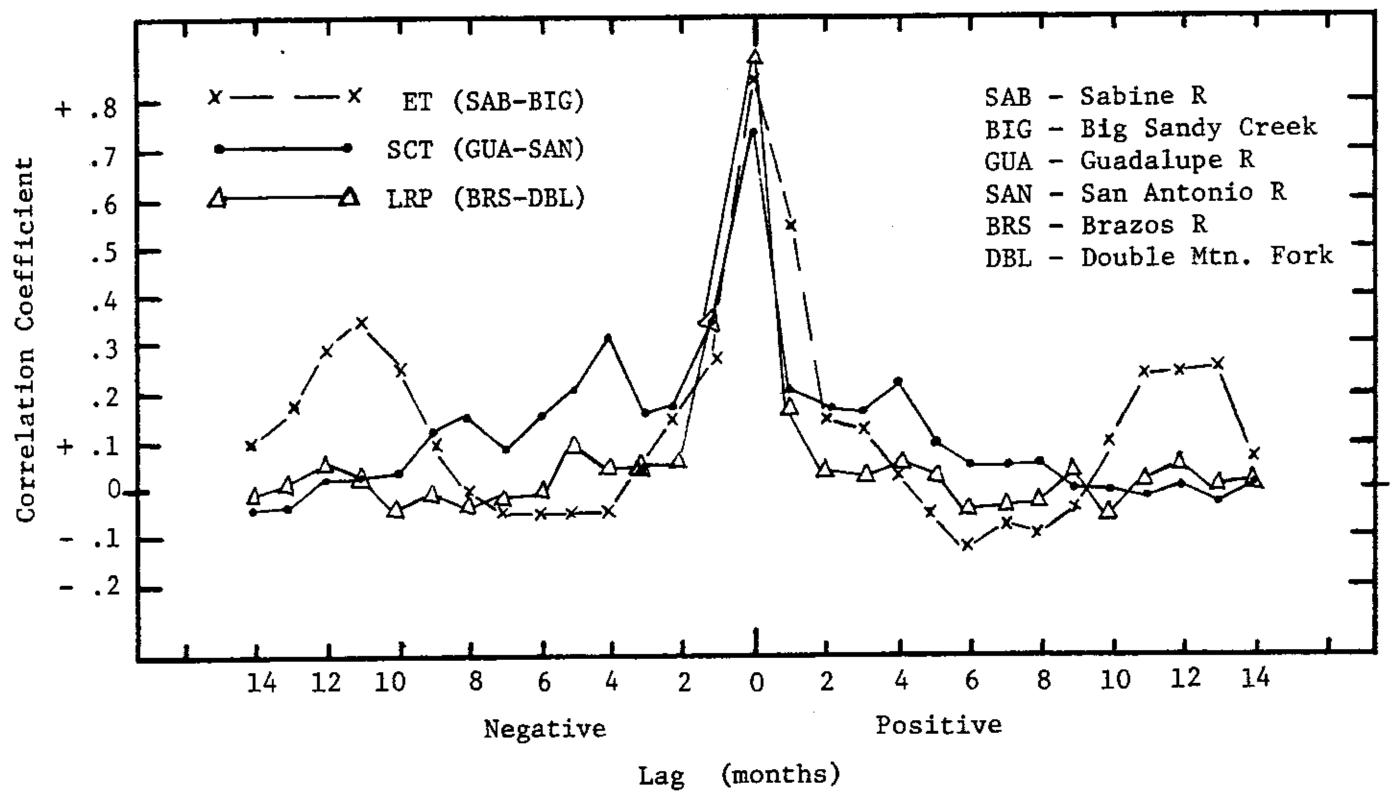


Figure 12. Lag-cross correlation of streamflow vs. streamflow for Low Rolling Plains (LRP), East Texas (ET), and South Central Texas (SCT).

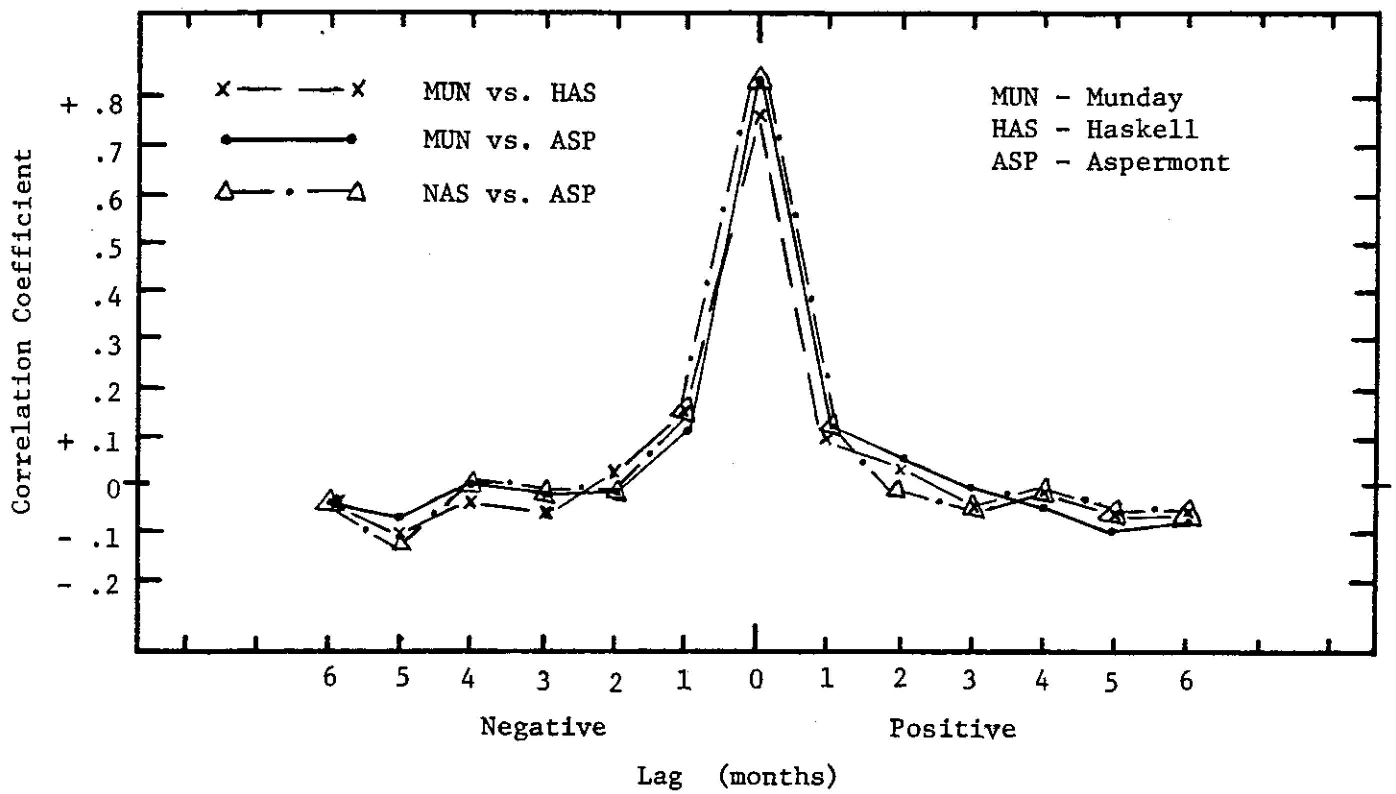


Figure 13. Lag-cross correlation of precipitation vs. precipitation for stations in Low Rolling Plains (LRP).

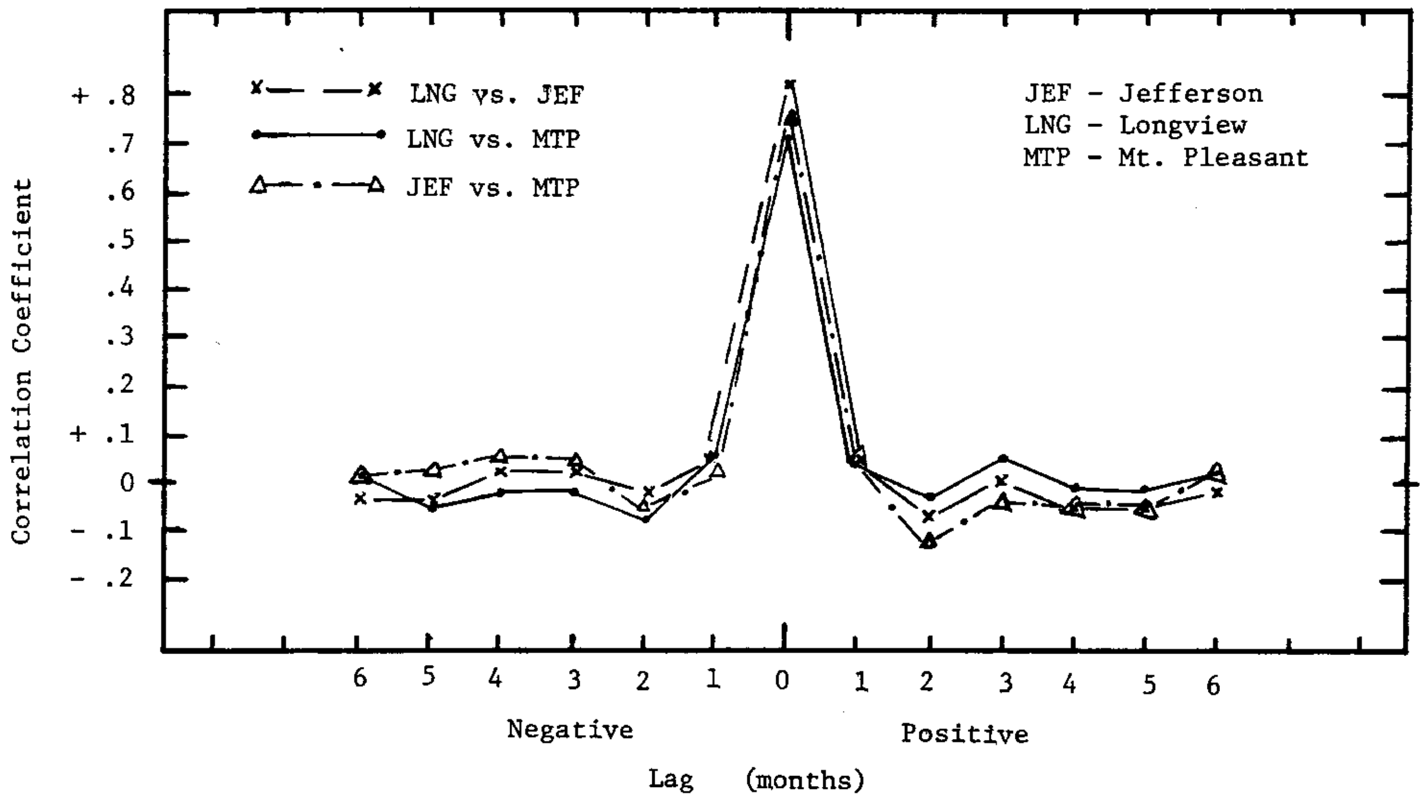


Figure 14. Lag-cross correlation of precipitation vs. precipitation for stations in East Texas (ET).

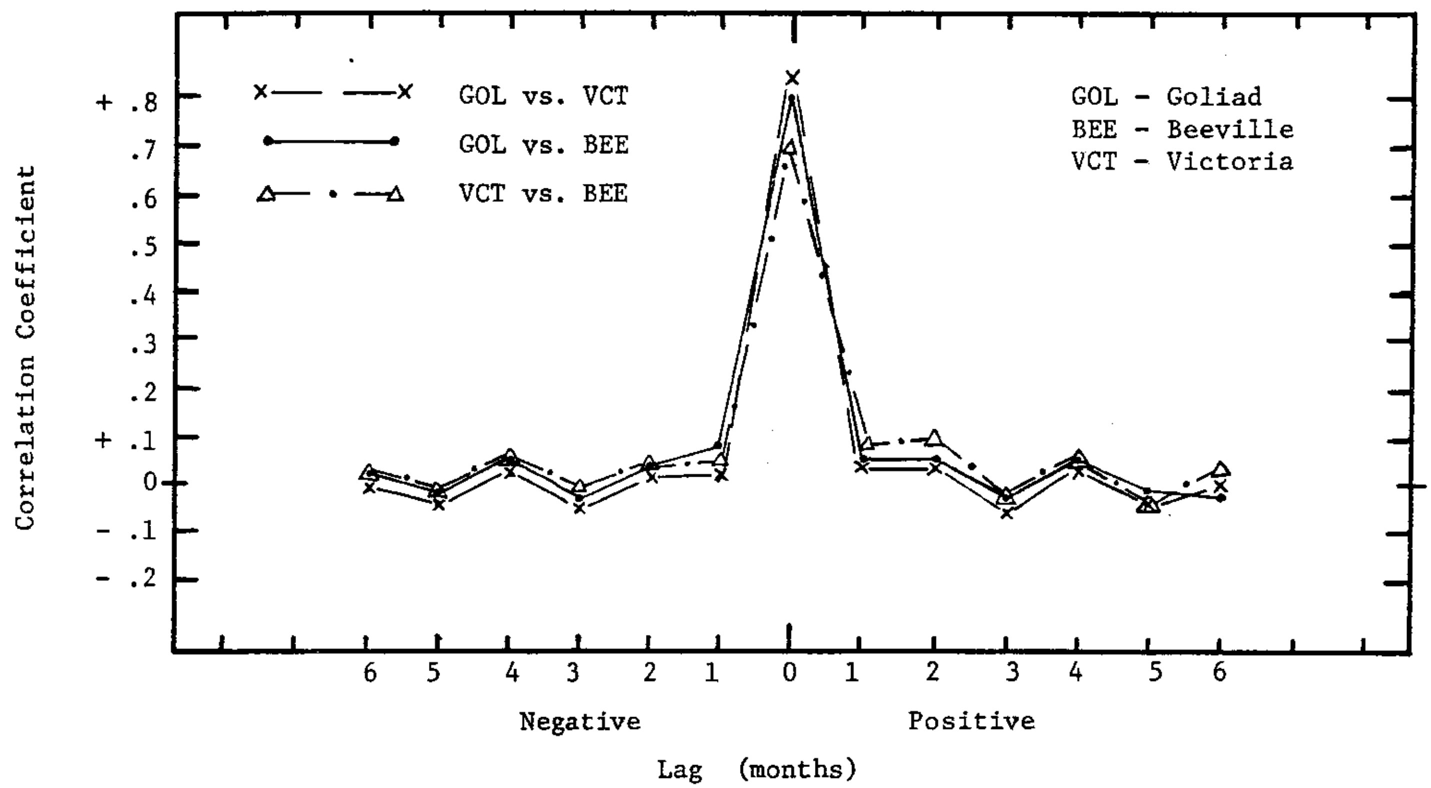


Figure 15. Lag-cross correlation of precipitation vs. precipitation for stations in South Central Texas (SCT).

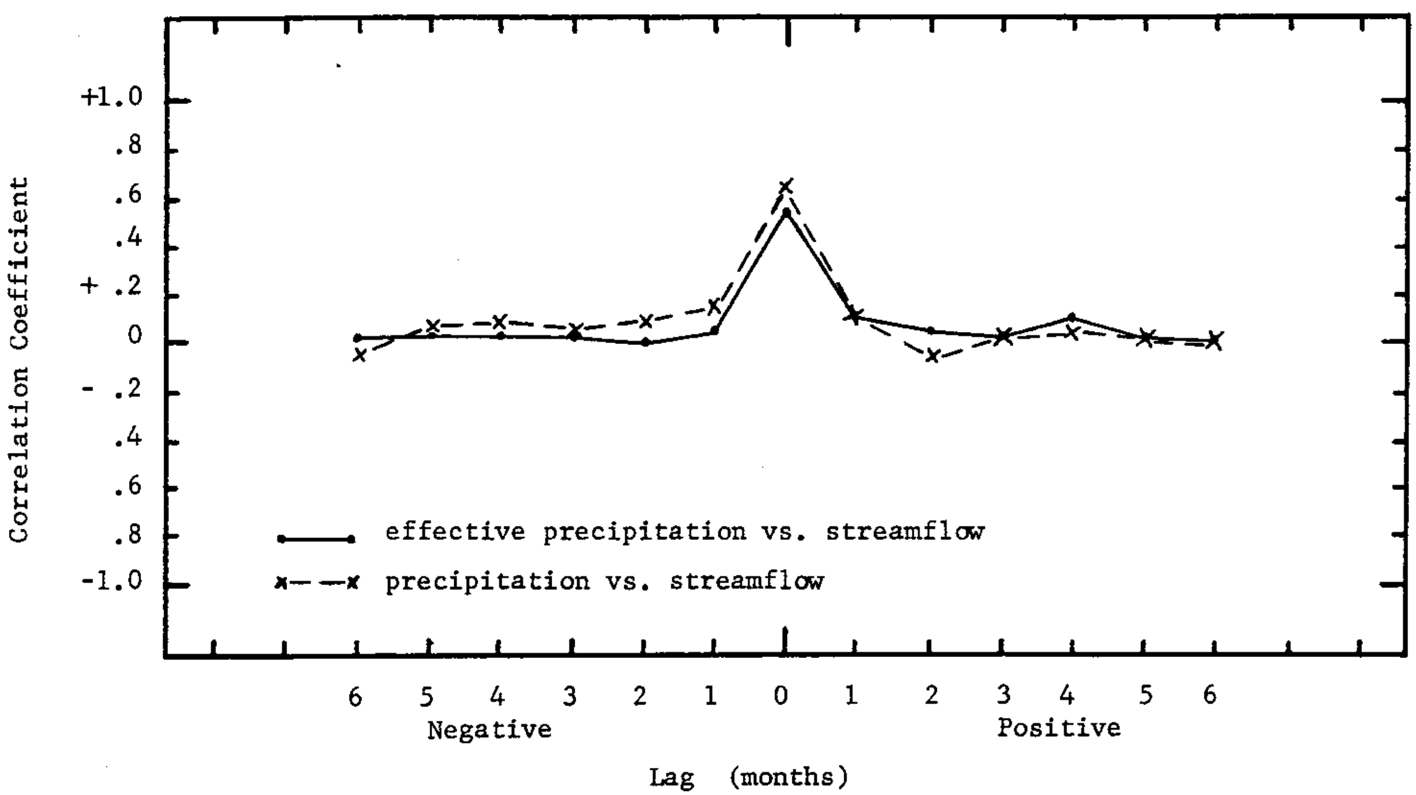


Figure 16. Lag-cross correlation between precipitation and streamflow, and between effective precipitation and streamflow for Goliad and San Antonio River (SCT).

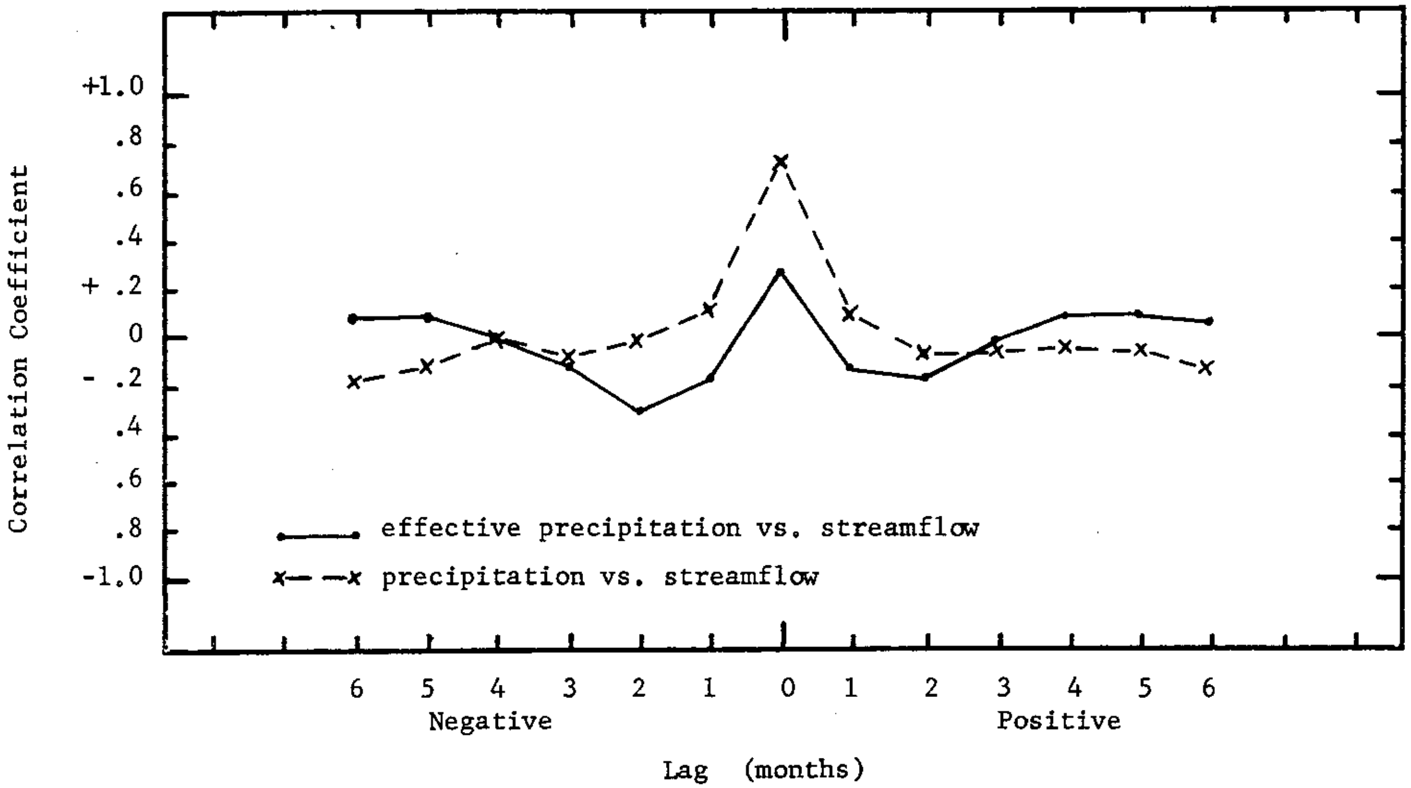


Figure 17. Lag-cross correlation between precipitation and streamflow, and between effective precipitation and streamflow for Aspermont and Double-Mountain Fork of Brazos River (LRP).

LRP region. In the LRP region, EP is related to several parameters which influence streamflow. An example of this is soil moisture, which may be low due to the amount of precipitation that has occurred, loss of water vapor from the soil due to high temperatures, and other soil factors. The amount of surface runoff will be dependent upon the amount of soil moisture and infiltration rate.

## Gumbel and Log-Pearson Type III

Monthly evaporation data were tested for suitability of the Gumbel distribution as a probability distribution. Data for all of the stations fit the distribution extremely well. The months of March and July for Spur Experiment Station are plotted in Figure 18. All data points fit closely around the theoretical lines. From these results, it appears that the Gumbel distribution could be used to extrapolate values for return periods greater than the 50-yr length of record with a reasonable degree of confidence. The fit of streamflow data was poor in a few instances because there was a tendency for some of the 30-yr values to be "outliers." Figure 19 is a plot for the month of February for the Sabine (ET) and Guadalupe (SCT) Rivers. It is apparent that the values for a return period of 30 yr are extremely high and deviate considerably from the theoretical line. A 30-yr record does not appear to be of sufficient length to fit the Gumbel distribution well. It was noted, however, that some months did fit the theoretical curve quite well while others did not. Extrapolation of streamflow data beyond the available period using a Gumbel

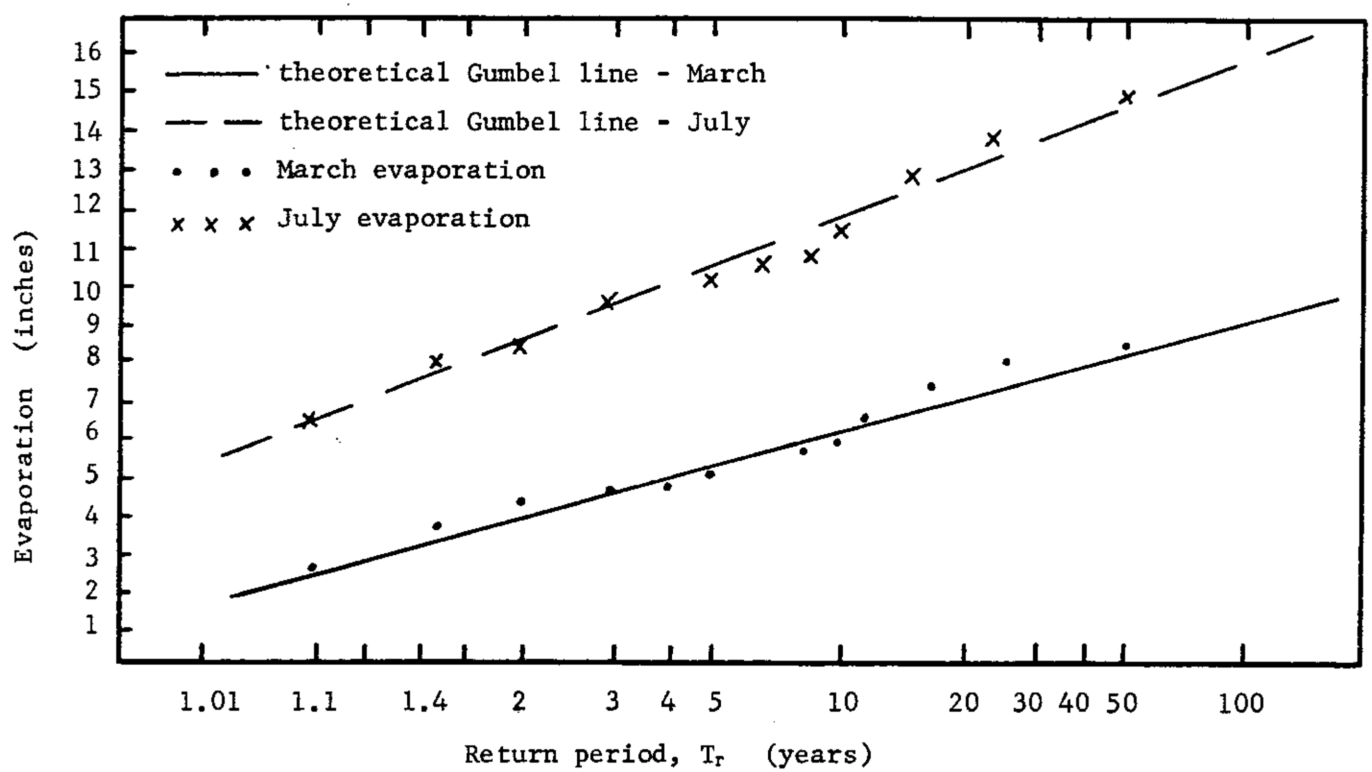


Figure 18. Fit of Spur Experiment Station (LRP) evaporation data to the Gumbel distribution.

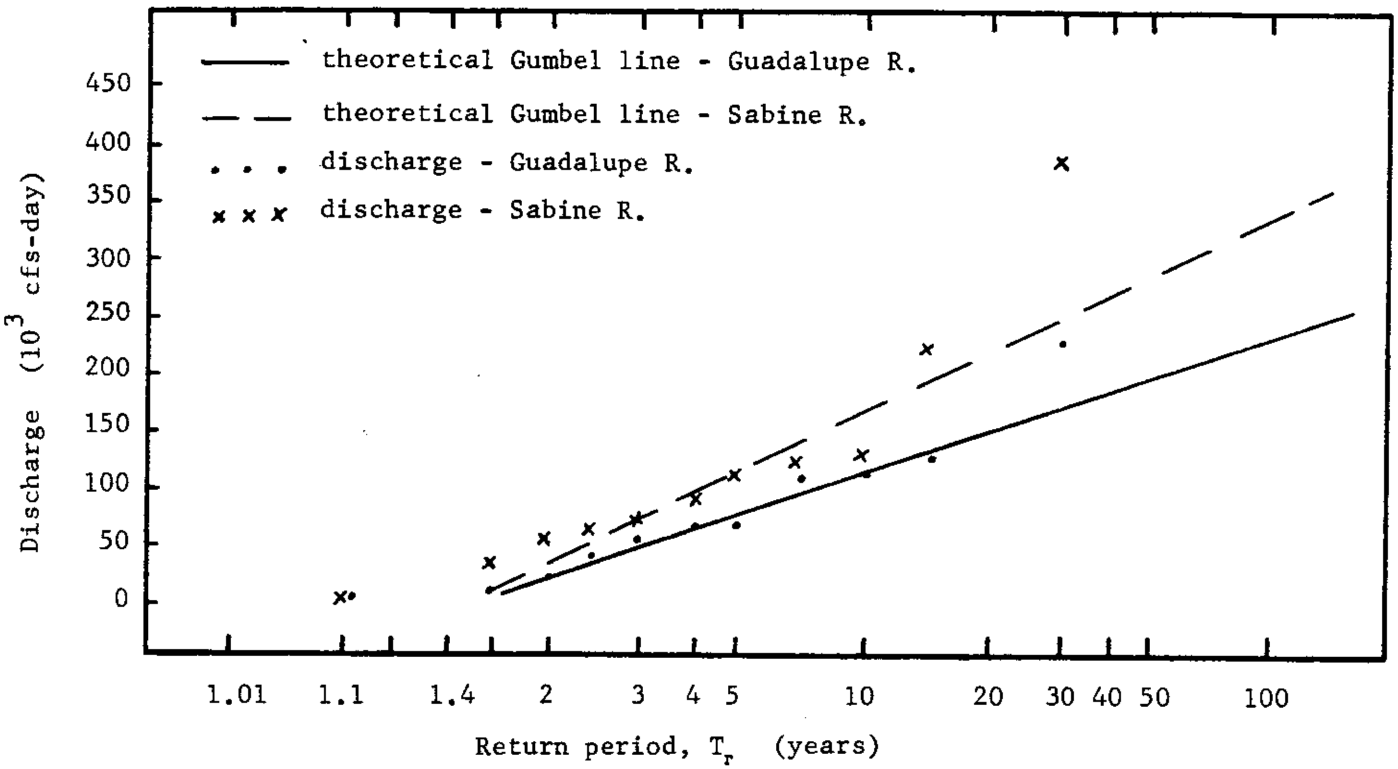


Figure 19. Fit of streamflow for Guadalupe River (SCT) and Sabine River (ET) to the Gumbel distribution for the month of February.

distribution is "risky." The Gumbel analysis of precipitation data had some "outliers" at extreme return periods. This is similar to the results obtained for streamflow. Extreme values of precipitation generally correspond to extreme values of streamflow. Points for the same period deviate significantly from a theoretical line. In Figure 20 high values were evident for the return periods in excess of 25 yr. If only the theoretical line was considered, the 100-yr value that would be determined is almost exactly the same as the actual maximum observed value. For the months where the data conformed closely to the theoretical line, a greater degree of confidence could be assumed in extending the line for longer return periods. Instances in which data did not fit the theoretical line, extension to larger return periods is highly questionable.

The log-Pearson type III method applied to precipitation data produced somewhat better results than the Gumbel method. Figure 21 shows the results for the Munday (LRP) and Longview (ET) Stations. These are examples of stations having the best results. Figures 20 and 22 are a comparison using the two methods for the same month and station. Both theoretical distributions fail to conform to extreme values for return periods greater than 25 yr. Again, even in the Pearson method, extrapolation of the theoretical line is doubtful due to "outliers." Although the Pearson method was designed to analyze streamflow data, precipitation data seem to fit this distribution with few exceptions.

The most encouraging results were in the analysis of streamflow

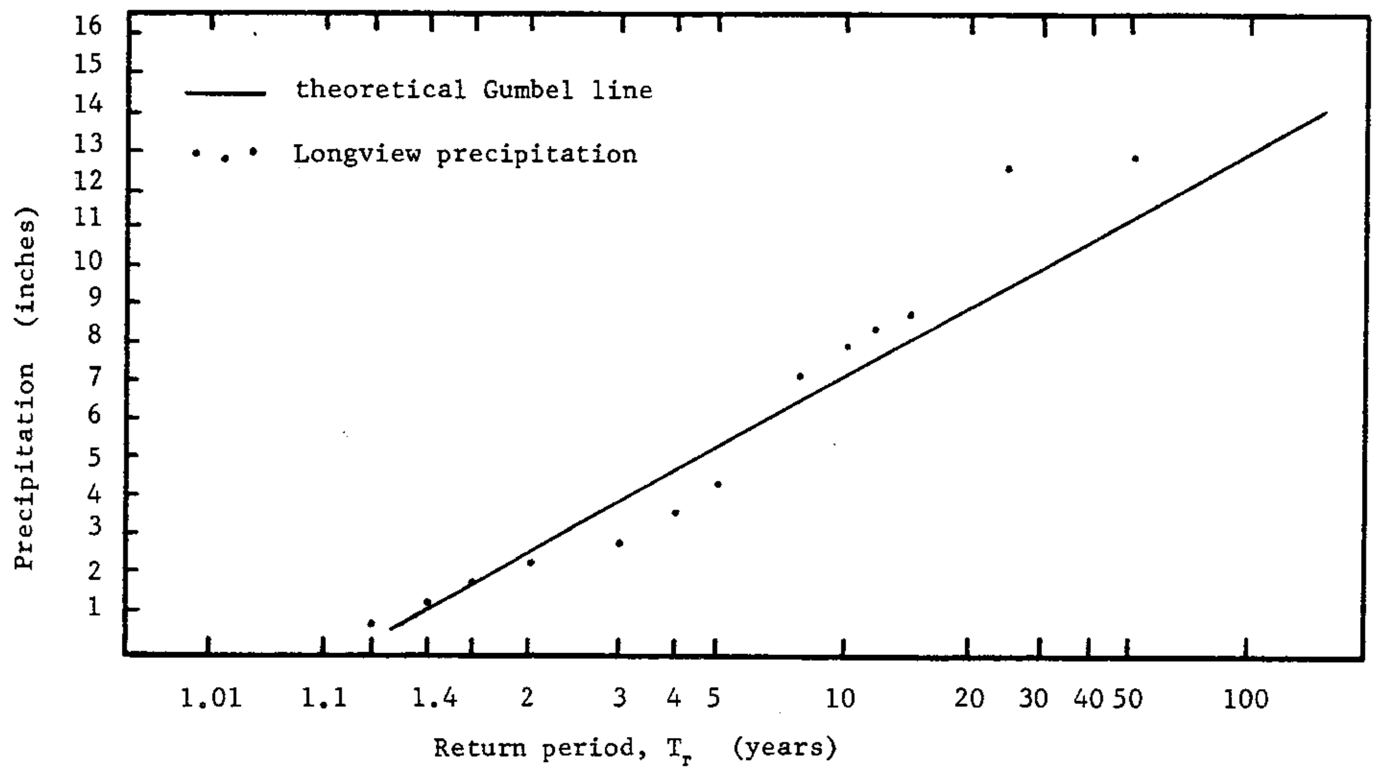


Figure 20. Fit of October precipitation data for Longview (ET) to the Gumbel distribution.

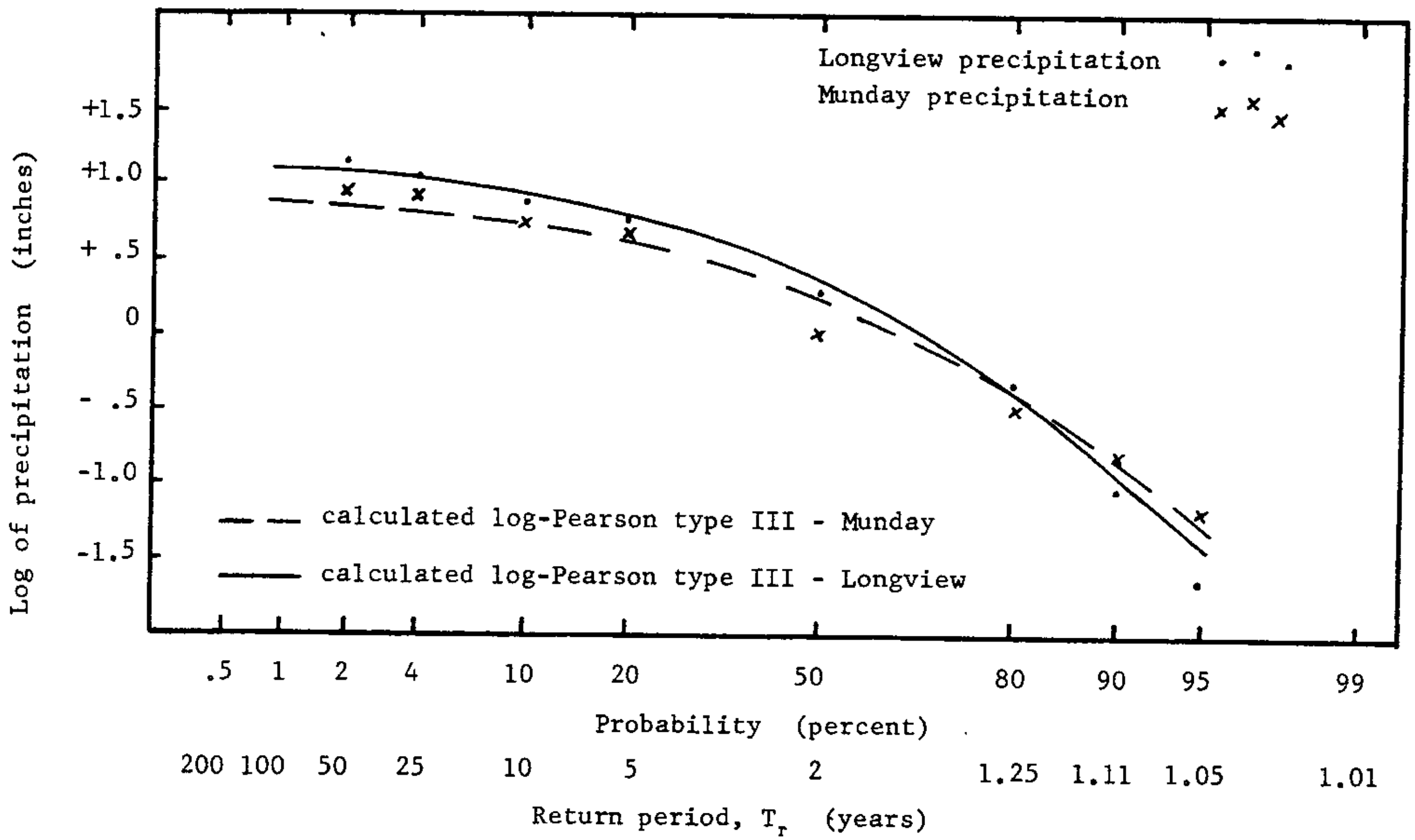


Figure 21. Calculated log-Pearson type III distribution compared with July precipitation data for Munday (LRP) and Longview (ET).

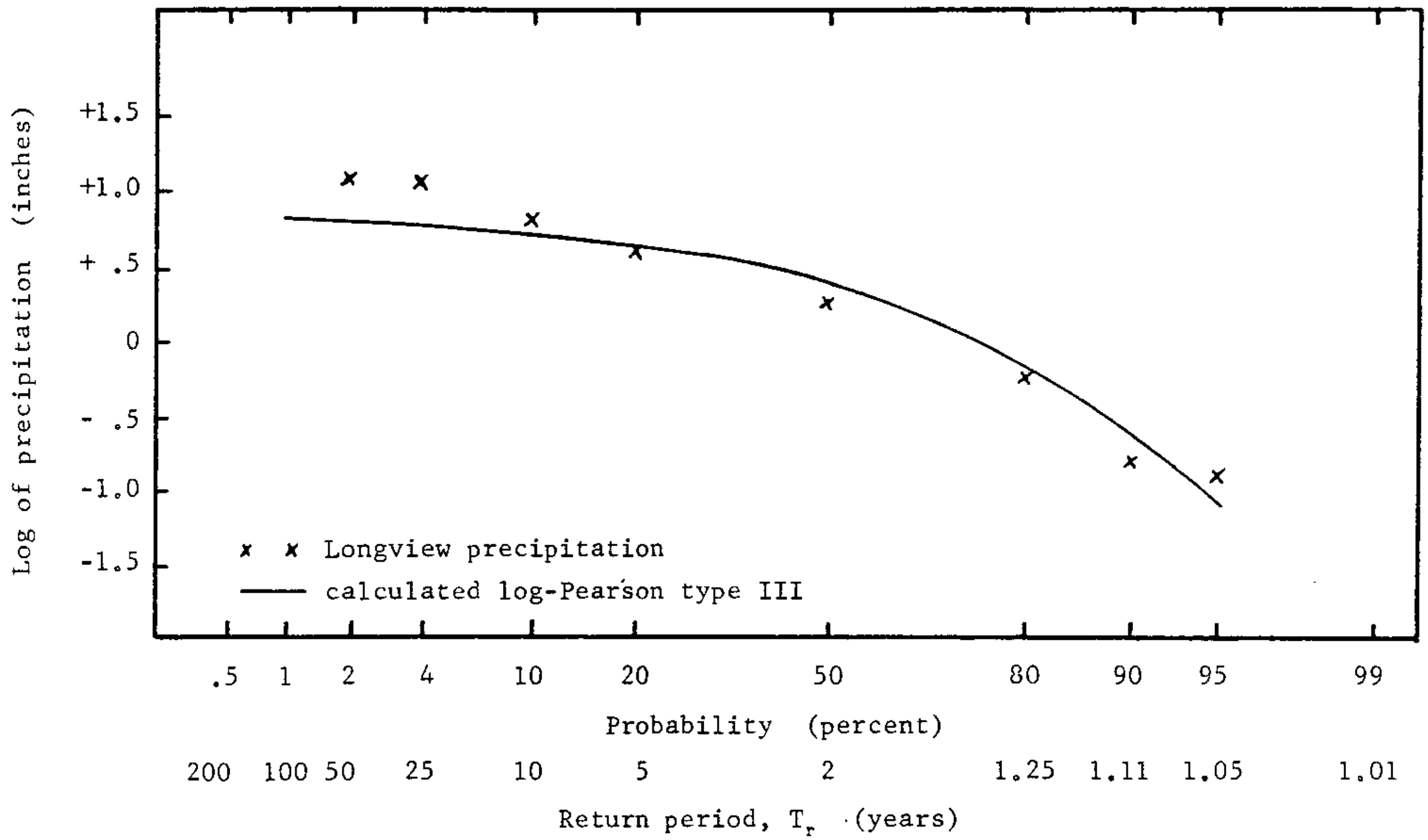


Figure 22. Calculated log-Pearson type III distribution compared with October precipitation data for Longview (ET).

data. Figure 23 presents a typical fit of streamflow data to the log-Pearson type III distribution. There were no cases where the data deviated ("outliers") as much as the extreme monthly precipitation data (Figure 22). The log-Pearson type III method was shown to be highly accurate in fitting the streamflow data. This comparison is evident when Figures 19 and 23 are compared. In all cases, there were no "outliers" in the Pearson method; however, "outliers" appeared with the Gumbel distribution.

An important point to note is that in the statistical analyses, all "outliers" or extreme values which caused the Chauvenet test to fail were checked to determine if they were "filled in." In all cases, "outliers" constituted real data and not statistically generated values.

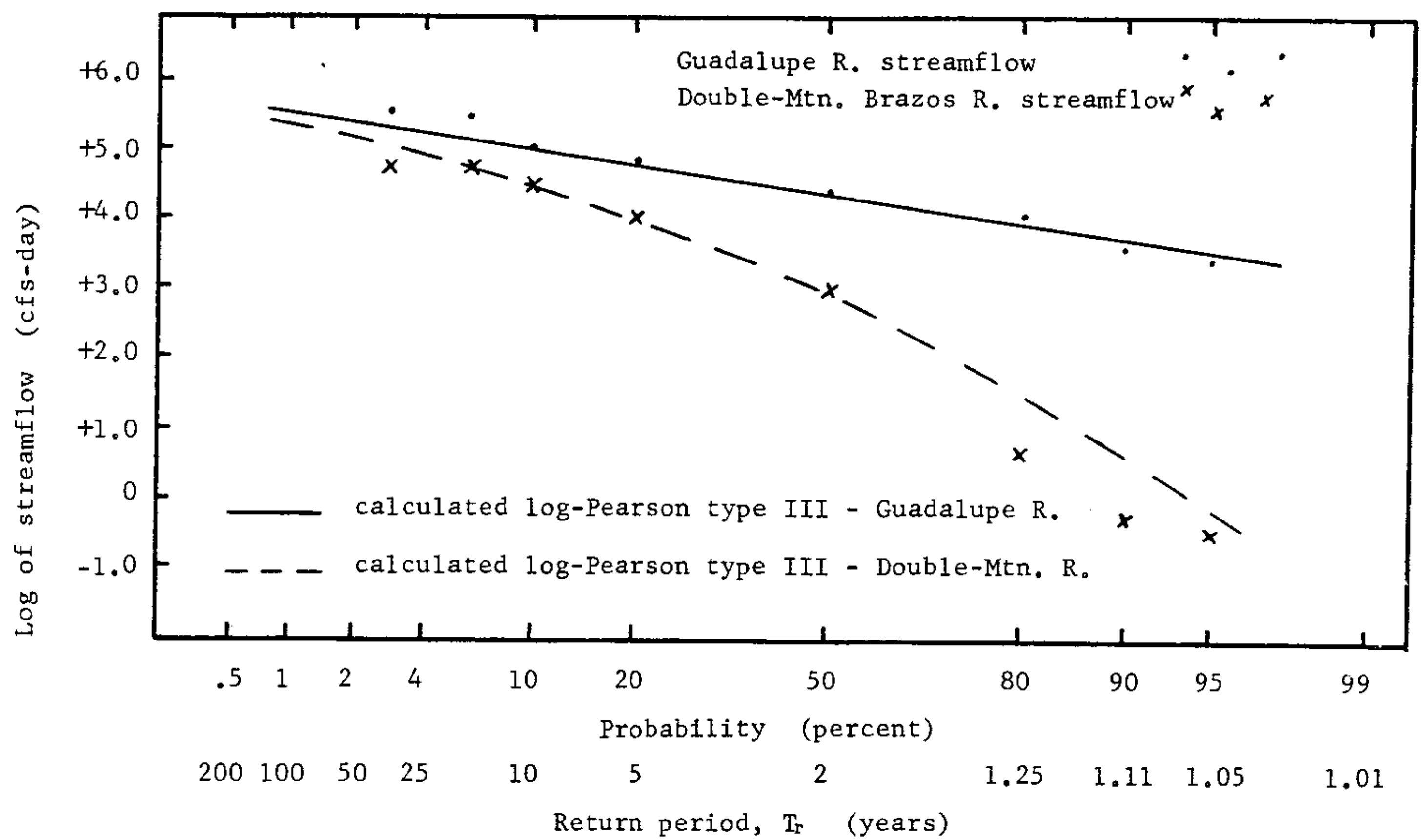


Figure 23. Calculated log-Pearson type III distribution compared with October streamflow data for Guadalupe River (SCT) and Double-Mountain Fork of Brazos River (LRP).

# CHAPTER V

## CONCLUSIONS

1. The precipitation data that were analyzed conformed best to the square-root-normal frequency distribution; however, the cube-root-normal distribution yielded similar results. Some precipitation data did not conform to either the log-Pearson type III or Gumbel distributions, but generally there was a good fit.

2. The evaporation data that were analyzed conformed equally well to the normal, log-normal, square-root-normal, and cube-root-normal distributions. The data also fit the Gumbel distribution well. No effort was made to fit the evaporation data to the log-Pearson type III distribution because the other distributions were satisfactory.

3. Streamflow data conformed, in general, to the log-normal distribution. However, the log-Pearson type III method gave the best fit of the data.

4. There were no significant monthly intercorrelations, except, for the evaporation data. These results demonstrate the independence of precipitation from one month to the next and the dependence of evaporation on the annual solar cycle.

5. The meteorological variables which correlated best with each other were:

   a. evaporation with temperature, and

   b. streamflow with precipitation and effective precipitation.

6. The type of frequency distribution used appears to be dependent upon the record length and the actual historical period or record available. Frequently, a given frequency distribution would pass the statistical tests where only 10 or 20 years of data were available and not pass when additional data were added. The influence of "outliers" on these data was quite evident.

7. The lag correlations indicate that the time scale of one month may be, in most instances, too long. Greater success might be attained if weekly, bi-weekly or even daily data are used in correlations of this type.

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# APPENDIX A

Results of the statistical test for the normal, square-root-normal, cube-root-normal, and log-normal frequency distributions. An "X" signifies that for the specified station, type of data, and record length, the data conform to the statistical values, found in Tables 3, 4, and 5. In this table the periods include only the first 10 years of record then additional periods are added on to include the entire period of record. Results presented in Appendix B include other 10-, 20-, and 30-yr periods than the first.

NORMAL DISTRIBUTION - January

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | | | | | | | | |
| Beeville | X | X | | | | | | | | | | | | | |
| Goliad | X | X | X | X | X | | X | X | | | | | | | |
| Jefferson | X | X | X | X | X | X | X | X | | X | | | X | | |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | X | X | X | | X | X | | X | | | X | | |
| Munday | | | | | | | | | | | | | | | |
| Haskell | | | | | | | | | | | | | | | |
| Spur | X | X | X | X | | | X | | | X | | | X | | |
| Aspermont | X | X | X | X | | | X | | | X | | | X | | |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville (E) | | X | | X | X | X | X | X | X | X | X | | X | X | |
| Double Mt. | X | X | | | | | | | | | | | | | |
| Brazos | | | | | | | | | | | | | | | |
| Big Sandy | X | X | | X | | | X | | | | | | | | |
| Sabine | X | X | | X | | | X | | | | | | | | |
| Guadalupe | | | | | | | | | | | | | | | |
| S.Antonio | | | | | | | | | | | | | | | |

NORMAL DISTRIBUTION - February

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | | X | | X | X | X | X | X | X | X | X | X | X | | |
| Beeville | X | X | X | X | X | X | X | | | | | | | | |
| Goliad | X | X | X | X | | | | | | | | | | | |
| Jefferson | X | X | X | X | X | X | | | | | | | X | | |
| Longview | | X | | X | X | | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | | X | | X | X | | X | X | | X | | | | | |
| Munday | X | X | X | X | X | X | X | X | X | X | | | X | | |
| Haskell | X | X | X | X | X | X | X | | | X | | | X | | |
| Spur | X | X | X | X | | | X | | | X | | | X | | |
| Aspermont | X | X | X | X | X | | X | | | X | | | | | |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | | | | | X | | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | | | X | | |
| Double Mt. | X | X | | | | | | | | | | | | | |
| Brazos | X | X | | | | | | | | | | | | | |
| Big Sandy | X | X | X | | | | X | | | | | | | | |
| Sabine | X | X | X | | | | | | | | | | | | |
| Guadalupe | X | X | X | | | | | | | | | | | | |
| S.Antonio | X | X | | | | | | | | | | | | | |

NORMAL DISTRIBUTION - March

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | | | | | | | | X | | | X | | |
| Beeville | X | X | X | X | X | X | | | | X | | | X | X | X |
| Goliad | X | X | X | | | | | | | | | | X | | |
| Jefferson | X | X | X | X | X | X | X | | | | | | | | |
| Longview | X | X | X | X | X | X | X | | | X | | | X | | |
| Mt. Pleas. | X | X | X | X | X | X | | | | | | | | | |
| Munday | X | X | | X | | | X | | | X | | | X | | X |
| Haskell | X | X | | X | X | X | X | X | X | X | | | | | |
| Spur | X | X | X | X | X | X | X | | X | X | | X | X | | X |
| Aspermont | | X | | X | | | X | | | X | | | X | | |
| Spur (E) | | X | X | | X | X | X | X | | | | | | | |
| Tyler (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | | X | X | X | X | X | X | X | X | | X | X | |
| Double Mt. | | | | | | | | | | | | | | | |
| Brazos | | | | | | | | | | | | | | | |
| Big Sandy | X | X | X | X | X | X | | | | | | | | | |
| Sabine | X | X | | X | X | | | | | | | | | | |
| Guadalupe | X | X | | | | | X | | | | | | | | |
| S. Antonio | X | X | X | X | X | X | | X | X | | | | | | |

NORMAL DISTRIBUTION - April

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | | | X | | | X | | X | X | | |
| Beeville | X | X | X | X | | | X | | | | | | | | |
| Goliad | X | X | X | X | | | X | | | X | | | X | | |
| Jefferson | | | | | | | | | | | | | | | |
| Longview | X | X | | | | | | | | | | | | | |
| Mt.Pleas. | | X | | | | | | | | | | | | | |
| Munday | X | X | | X | X | | X | | | | | | X | | |
| Haskell | | | | X | | | X | | | X | | | | | |
| Spur | X | X | X | X | | | X | | | | | | X | | |
| Aspermont | X | X | X | X | X | X | X | | X | X | | | X | | |
| Spur (E) | X | X | | X | X | X | | X | | | X | | | X | |
| Tyler (E) | X | X | X | | X | | X | X | | X | X | X | X | X | X |
| Beeville (E) | X | X | | X | X | X | X | X | X | X | X | | X | X | |
| Double Mt. | X | X | | | | | | | | | | | | | |
| Brazos | | | | | | | | | | | | | | | |
| Big Sandy | X | X | X | X | | | X | | | | | | | | |
| Sabine | X | X | X | X | | | | | | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | | | | | | | | |
| S.Antonio | X | X | X | | | | | | | | | | | | |

NORMAL DISTRIBUTION - May

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | | | | | | | X | | | X | | | X | | |
| Beeville | X | X | X | X | | | X | X | | X | | | X | | X |
| Goliad | X | X | X | X | X | X | | X | X | | X | X | | | X |
| Jefferson | X | X | X | X | X | X | X | | | X | | | X | | |
| Longview | X | X | X | X | X | X | X | X | | X | X | | X | | |
| Mt.Pleas. | X | X | X | X | X | X | X | | | X | | | X | | |
| Munday | X | X | X | X | X | X | X | | | X | | | | | |
| Haskell | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur | X | X | X | X | X | X | X | X | X | X | | X | X | | X |
| Aspermont | X | X | X | X | X | X | X | X | | X | X | | X | | |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | | X | | |
| Tyler (E) | X | X | X | X | X | | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Double Mt. | | | | X | | | | | | | | | | | |
| Brazos | X | X | | X | X | X | X | | | | | | | | |
| Big Sandy | X | X | | X | X | X | X | | | | | | | | |
| Sabine | X | X | | X | X | X | X | | X | | | | | | |
| Guadalupe | X | X | X | X | | | | | | | | | | | |
| S.Antonio | X | X | | X | | | X | | | | | | | | |

NORMAL DISTRIBUTION - June

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | | X | | | | | X | | | X | | | X | | |
| Beeville | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Goliad | X | X | X | X | X | X | X | X | | X | | | X | | |
| Jefferson | | | | | | | X | | | | | | X | | |
| Longview | X | X | X | X | X | | X | X | | X | | | X | | |
| Mt.Pleas. | X | X | X | X | X | X | X | | | X | | | X | | |
| Munday | X | X | | X | X | | X | X | | X | | | X | | X |
| Haskell | X | X | X | X | X | X | X | X | X | X | | | X | X | X |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | | X | | | X | | | X | | | X | | |
| Spur (E) | X | X | X | X | X | | X | | | X | | | | | |
| Tyler (E) | X | X | X | X | X | | X | X | | X | X | X | X | X | X |
| Beeville (E) | X | X | X | | X | | | X | | | | | | | |
| Double Mt. | X | X | X | X | X | X | X | | | | | | | | |
| Brazos | X | X | X | X | X | | X | | | | | | | | |
| Big Sandy | X | X | X | X | | | | | | | | | | | |
| Sabine | X | X | | X | | | | | | | | | | | |
| Guadalupe | X | X | X | X | | | X | | | | | | | | |
| S.Antonio | X | X | | X | | | X | | | | | | | | |

NORMAL DISTRIBUTION - July

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | | X | | | X | | | X | | |
| Beeville | X | X | X | X | X | X | | | | X | | | X | | |
| Goliad | X | X | X | X | X | X | | | | X | | | X | | |
| Jefferson | X | X | X | X | X | X | X | X | X | X | | | X | | |
| Longview | X | X | X | X | | | | | | X | | | X | | |
| Mt.Pleas. | X | X | | X | X | X | X | X | X | X | X | | X | | |
| Munday | X | X | | X | X | X | X | | | X | | | X | | |
| Haskell | X | X | X | X | X | X | X | | | X | | | X | X | |
| Spur | | X | | | X | | X | X | | X | X | | X | | |
| Aspermont | X | X | X | X | X | | X | | | X | | | X | | |
| Spur (E) | X | X | X | X | X | X | X | X | | X | | | | | |
| Tyler (E) | X | X | | | | | | | | | | | X | | X |
| Beeville (E) | | X | X | X | X | X | X | X | | X | X | | | X | |
| Double Mt. | X | X | X | X | | X | X | | | | | | | | |
| Brazos | X | X | X | X | | | X | | | | | | | | |
| Big Sandy | X | X | | X | | | X | | | | | | | | |
| Sabine | X | X | | X | X | | | | | | | | | | |
| Guadalupe | X | X | X | X | | | | | | | | | | | |
| S.Antonio | X | X | | X | | | | | | | | | | | |

NORMAL DISTRIBUTION - August

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | | X | X | | X | X | | X | X |
| Beeville | X | X | | X | X | | X | | | X | | | X | | |
| Goliad | X | X | | X | | | X | | | | | | X | | |
| Jefferson | X | X | X | X | X | X | X | | | X | | | X | | |
| Longview | | X | | | | | | | | | | | | | |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Munday | X | X | | X | | | | | | X | | | X | | |
| Haskell | | | | | | | | | | | | | | | |
| Spur | | | | | | | | | | | | | | | |
| Aspermont | | | | | | | | | | | | | | | |
| Spur (E) | X | X | X | X | X | | X | X | | X | | | X | | |
| Tyler (E) | X | X | X | X | X | | X | X | | X | X | | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | | X | | | X | | | | | | | | |
| Brazos | | | | | | | | | | | | | | | |
| Big Sandy | X | X | | | | | | | | | | | | | |
| Sabine | | X | | | | | | | | | | | | | |
| Guadalupe | X | X | X | X | | | X | X | | | | | | | |
| S.Antonio | X | X | | X | X | | X | | | | | | | | |

NORMAL DISTRIBUTION - September

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | | X | | | | | | | | | | | |
| Beeville | | | | | | | | | | | | | | | |
| Goliad | | | | | | | | | | | | | | | |
| Jefferson | X | X | X | | | | | | | | | | | | |
| Longview | X | X | X | | X | X | | | | X | | | | | |
| Mt.Pleas. | X | X | X | X | X | X | X | X | | X | | | X | | |
| Munday | X | X | X | X | X | | X | | | X | | | X | | |
| Haskell | X | X | | X | X | | X | X | | X | | | X | | X |
| Spur | | | | X | | | | | | | | | | | |
| Aspermont | X | X | | X | X | X | X | | | X | | | X | | |
| Spur (E) | X | X | | X | X | | X | X | | X | | | X | | |
| Tyler (E) | X | X | X | X | X | | X | X | | X | X | | X | X | |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | | | | | | | | | | | | | | | |
| Brazos | X | X | X | X | | | | | | | | | | | |
| Big Sandy | X | X | X | X | X | | X | X | | | | | | | |
| Sabine | X | X | X | X | X | | X | X | X | | | | | | |
| Guadalupe | | | | | | | | | | | | | | | |
| S.Antonio | | | | | | | | | | | | | | | |

NORMAL DISTRIBUTION - October

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | | | | | | | X | | | | | | | | |
| Beeville | X | X | X | | X | X | X | X | X | X | | X | X | | X |
| Goliad | | | | X | | | X | | | X | | | X | | |
| Jefferson | X | X | X | X | X | | X | | | X | | | X | | |
| Longview | X | X | X | | | | | | | | | | | | |
| Mt.Pleas. | X | X | X | X | | | | | | | | | X | | |
| Munday | X | X | | | | | X | | | | | | X | | |
| Haskell | X | X | X | X | X | X | | | | | | | | | |
| Spur | X | X | | X | X | | X | | | | | | X | | |
| Aspermont | X | X | | X | X | | | | | | | | X | | |
| Spur (E) | X | X | X | X | X | | | X | | | X | | | X | |
| Tyler (E) | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville (E) | | X | | | X | | X | X | | X | X | | X | X | |
| Double Mt. | | | | | | | | | | | | | | | |
| Brazos | | | | | | | | | | | | | | | |
| Big Sandy | X | X | X | | | | | | | | | | | | |
| Sabine | | | | | | | | | | | | | | | |
| Guadalupe | | | | | | | | | | | | | | | |
| S.Antonio | | | | | | | | | | | | | | | |

NORMAL DISTRIBUTION - November

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | | X | X | X | X | | | X | | |
| Beeville | X | X | | X | X | X | X | X | | X | | X | X | | |
| Goliad | X | X | X | X | X | X | X | X | X | X | | | X | | |
| Jefferson | X | X | | X | X | | | | | | | | X | | |
| Longview | X | X | X | X | X | X | X | X | | X | X | | X | | |
| Mt.Pleas. | X | X | X | X | X | X | X | X | | X | | | X | | |
| Munday | X | X | X | X | | | X | X | | X | | | X | | |
| Haskell | X | X | X | X | X | X | X | X | X | X | | | X | | |
| Spur | X | X | X | X | X | X | X | | X | X | | X | X | | X |
| Aspermont | X | X | X | X | X | X | X | X | X | X | | | X | | |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | | | X | | |
| Tyler (E) | | X | | X | X | | X | X | | X | X | | X | X | |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | |
| Double Mt. | X | X | X | | | | | | | | | | | | |
| Brazos | X | X | | | | | | | | | | | | | |
| Big Sandy | X | X | | | | | | | | | | | | | |
| Sabine | | | | | | | | | | | | | | | |
| Guadalupe | | | | | | | | | | | | | | | |
| S.Antonio | X | X | | X | | | | | | | | | | | |

NORMAL DISTRIBUTION - December

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | X | X | X | | X | | |
| Beeville | X | X | | X | | | X | | | X | | | X | | |
| Goliad | X | X | | X | X | | X | | | X | | | | | |
| Jefferson | X | X | | X | X | | X | | | X | | X | X | | X |
| Longview | | X | X | | | | | | | | | | X | | |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Munday | X | X | | X | | | X | X | X | | | | | | |
| Haskell | | X | | | | | X | X | X | X | | | | | |
| Spur | X | X | | X | | | X | | | X | | | X | | |
| Aspermont | | X | | | | | X | X | | | | | | | |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | | X | X | | X |
| Tyler (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | | | | | | | | | | | | | | | |
| Brazos | X | X | | | | | X | | | | | | | | |
| Big Sandy | X | X | | X | | | X | | | | | | | | |
| Sabine | X | X | | | | | X | | | | | | | | |
| Guadalupe | X | X | | X | X | | | | | | | | | | |
| S.Antonio | X | X | | X | | | | | | | | | | | |

SQUARE-ROOT-NORMAL DISTRIBUTION - January

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | X | X | | | X | | |
| Beeville | X | X | X | X | X | | X | X | | | | | X | | |
| Goliad | X | X | X | X | X | X | | X | X | X | X | | X | X | |
| Jefferson | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Munday | X | X | | X | X | | X | X | | X | | | X | X | |
| Haskell | X | X | X | X | X | | X | X | | X | X | | X | X | |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | | X | X |
| Aspermont | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur (E) | X | X | X | X | X | | X | X | X | X | X | X | X | X | |
| Tyler (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | | | | | | | | | | | |
| Brazos | X | X | | | | | | | | | | | | | |
| Big Sandy | X | X | | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | | X | X | X | X | X | X | | | | | | |
| Guadalupe | | X | | X | | | X | | | | | | | | |
| S.Antonio | | | | | | | | | | | | | | | |

SQUARE-ROOT-NORMAL DISTRIBUTION - February

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville | X | X | | X | X | X | X | X | X | X | X | X | X | X | |
| Goliad | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Jefferson | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Longview | | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Mt.Pleas. | | X | | | X | X | X | X | X | | X | | | X | |
| Munday | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Haskell | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | | | | | X | X | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | | | | | | | | | | | | |
| Brazos | X | X | X | X | X | | X | | | | | | | | |
| Big Sandy | X | X | X | X | | | X | X | | | | | | | |
| Sabine | X | X | X | | | | | | | | | | | | |
| Guadalupe | X | X | X | X | | | X | | | | | | | | |
| S.Antonio | X | X | X | X | | | | | | | | | | | |

SQUARE-ROOT-NORMAL DISTRIBUTION - March

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | | | X | | | X | X | | X | X | X |
| Beeville | X | X | X | X | X | X | X | X | | X | X | X | X | X | X |
| Goliad | X | X | X | | | | X | | | X | | | X | X | |
| Jefferson | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Longview | X | X | X | X | X | X | X | X | | X | X | | X | X | X |
| Mt.Pleas. | X | X | X | X | X | X | | | | | | | | | |
| Munday | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Haskell | X | X | | | X | X | | X | X | X | X | X | X | X | X |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | | X | X | | X | X | | X | X | X | X | X | X |
| Spur (E) | | X | X | | X | X | X | X | X | X | X | | X | X | |
| Tyler (E) | X | X | X | X | X | X | X | X | X | X | X | X | | X | X |
| Beeville (E) | X | X | | X | X | X | X | X | X | X | X | X | X | X | |
| Double Mt. | | | | | | | | | | | | | | | |
| Brazos | | X | | | | | | | | | | | | | |
| Big Sandy | X | X | X | X | X | X | | | | | | | | | |
| Sabine | X | X | X | X | X | X | | X | | | | | | | |
| Guadalupe | X | X | X | X | X | | X | X | X | | | | | | |
| S.Antonio | X | X | X | X | X | X | X | X | X | | | | | | |

SQUARE-ROOT-NORMAL DISTRIBUTION - April

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Goliad | X | X | X | X | X | X | X | X | X | X | X | X | X | X | |
| Jefferson | | X | | | X | | | | | | | | | | |
| Longview | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Mt.Pleas. | X | X | | X | X | | | X | | X | X | | X | X | |
| Munday | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Haskell | X | X | | X | X | | X | X | | X | X | | X | X | |
| Spur | X | X | X | X | X | | X | X | | X | X | | X | X | |
| Aspermont | X | X | X | X | X | X | X | X | X | X | X | | X | X | X |
| Spur (E) | X | X | | X | X | X | | X | X | | X | | | X | |
| Tyler (E) | X | X | X | | X | | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | | | | | | | | | | | |
| Brazos | X | X | | X | | X | X | | | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | | | | | | | | |
| Sabine | X | X | X | X | X | | | | | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | X | X | | | | | | |
| S.Antonio | X | X | X | | | | | | | | | | | | |

SQUARE-ROOT-NORMAL DISTRIBUTION - May

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | | X | | X | X | | X | X | | X | X | X | X | | X |
| Beeville | X | X | X | X | X | | X | X | X | X | X | X | X | X | X |
| Goliad | X | X | X | X | X | X | X | X | X | | X | X | | X | X |
| Jefferson | X | X | X | X | X | X | X | X | | X | X | X | X | X | X |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | | X | | |
| Munday | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Haskell | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | X | X | X | | X | X | X | X | X | | X | X | |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | X | X | X | X | X | | X | X | | X | X | | X | X | |
| Beeville (E) | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Double Mt. | | X | | X | X | X | X | | | | | | | | |
| Brazos | X | X | | X | X | X | X | | | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | | X | X | X | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | | | | | | | | |
| S.Antonio | X | X | | X | X | X | X | | | | | | | | |

SQUARE-ROOT-NORMAL DISTRIBUTION - June

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | | X | | X | X | | X | X | X | X | X | X | X | X | X |
| Beeville | | X | | X | X | X | X | X | | X | X | X | X | X | X |
| Goliad | | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Jefferson | | X | | X | X | | X | X | | X | X | | X | X | |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Munday | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Haskell | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur | X | X | X | X | X | X | X | | | X | X | X | X | X | X |
| Aspermont | X | X | X | X | X | | X | X | | X | X | | X | X | |
| Spur (E) | X | X | | X | X | | X | X | | X | | | X | X | |
| Tyler (E) | X | X | X | X | X | | X | X | | | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | | X | X | | | X | | | X | |
| Double Mt. | X | X | X | X | X | X | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | X | X | X | X | | | | | | |
| Big Sandy | X | X | X | X | X | | X | | | | | | | | |
| Sabine | X | X | X | X | X | | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | X | X | | | | | | |
| S.Antonio | X | X | X | X | X | | X | X | | | | | | | |

SQUARE-ROOT-NORMAL DISTRIBUTION - July

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | | X | X | | X | X | X |
| Beeville | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Goliad | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Jefferson | | X | X | X | X | | X | X | X | X | X | X | X | X | X |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Munday | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Haskell | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | | X | | |
| Tyler (E) | X | X | X | X | X | | | X | | | X | X | X | X | X |
| Beeville (E) | | X | X | X | X | X | X | X | | X | X | | | X | |
| Double Mt. | X | X | X | X | X | X | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | X | X | X | X | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | | | | | | | | |
| Guadalupe | X | X | X | X | X | X | | | | | | | | | |
| S.Antonio | X | X | | X | X | | | | | | | | | | |

SQUARE-ROOT-NORMAL DISTRIBUTION - August

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | | X | X | | X | X | | X | X |
| Beeville | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Goliad | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Jefferson | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Longview | | X | X | X | X | X | X | X | X | X | X | | X | X | X |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Munday | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Haskell | X | X | | | X | | | X | | X | X | | X | X | X |
| Spur | | X | | X | | | X | X | | X | X | | X | X | |
| Aspermont | | X | | | X | | X | X | X | X | X | | X | X | |
| Spur (E) | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Tyler (E) | X | X | X | X | X | | X | X | | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | X | | X | X | | | | | | | |
| Brazos | | X | | | | | X | X | | | | | | | |
| Big Sandy | X | X | | X | X | | X | X | | | | | | | |
| Sabine | X | X | | | | | | | | | | | | | |
| Guadalupe | X | X | X | X | X | | X | X | X | | | | | | |
| S.Antonio | X | X | X | X | X | X | X | X | X | | | | | | |

SQUARE-ROOT-NORMAL DISTRIBUTION - September

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | | X | X | X | X | X | | X | X | | | X | |
| Beeville | | | | | | | | | | | | | X | | |
| Goliad | | | | X | X | | X | X | | X | | | X | | |
| Jefferson | X | X | X | X | X | | X | X | | X | X | | X | X | |
| Longview | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Munday | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Haskell | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur (E) | X | X | | X | X | | X | X | | X | X | | X | X | |
| Tyler (E) | X | X | X | X | X | | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | | X | | | X | | | | | | | | |
| Brazos | X | X | X | X | X | | X | | | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | | | | X | | | X | | | | | | | | |
| S.Antonio | | | | | | | | | | | | | | | |

SQUARE-ROOT-NORMAL DISTRIBUTION - October

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | | X | X | | X | X | | X | X | | X | X | |
| Beeville | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Goliad | X | X | | X | X | | X | X | | X | X | | X | X | |
| Jefferson | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Longview | X | X | X | | X | | | X | | | X | | | X | X |
| Mt.Pleas. | X | X | X | X | X | | X | X | | | X | | X | X | X |
| Munday | X | X | | X | X | | X | X | | X | X | X | X | X | X |
| Haskell | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Spur | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | X | X | X | X | X | X | | X | X | X | X | X | X |
| Spur (E) | X | X | X | X | X | | | X | | | X | | | X | |
| Tyler (E) | X | X | | X | X | X | X | X | X | X | X | X | X | X | |
| Beeville (E) | | X | | | X | | X | X | | X | X | | X | X | |
| Double Mt. | X | | | X | | | X | | | | | | | | |
| Brazos | X | X | | X | | | X | | | | | | | | |
| Big Sandy | X | X | X | | | | | | | | | | | | |
| Sabine | | X | | X | | | | | | | | | | | |
| Guadalupe | | | | | | | | | | | | | | | |
| S.Antonio | | X | | X | X | | | | | | | | | | |

SQUARE-ROOT-NORMAL DISTRIBUTION - November

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Goliad | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Jefferson | X | X | X | X | X | X | X | X | | X | X | X | X | X | X |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Munday | X | X | X | X | X | X | X | X | X | X | X | | X | X | X |
| Haskell | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | | X | | X | X | | X | X | | X | X | | X | X | |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | | | X | | | | | | | | |
| Brazos | X | X | X | X | | | X | X | | | | | | | |
| Big Sandy | X | X | | | | | | | | | | | | | |
| Sabine | | X | | | | | | | | | | | | | |
| Guadalupe | | | | X | | | X | | | | | | | | |
| S.Antonio | X | X | | X | X | | X | | | | | | | | |

SQUARE-ROOT-NORMAL DISTRIBUTION - December

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Goliad | X | X | X | X | X | X | X | X | X | X | X | X | X | X | |
| Jefferson | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Longview | X | X | | X | X | | | X | X | | X | X | X | X | X |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Munday | | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Haskell | | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | | X | X | X | X | X | X | X | X | X | X | | X | X | X |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | | X | | | | | X | | | | | | | | |
| Brazos | X | X | X | X | X | | X | X | | | | | | | |
| Big Sandy | X | X | X | X | X | | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | | | | | | | | |
| S.Antonio | X | X | X | X | X | | X | | | | | | | | |

CUBE-ROOT-NORMAL DISTRIBUTION - January

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Beeville | X | X | X | X | X | | X | X | X | X | X | | X | X | |
| Goliad | X | X | X | X | X | X | | X | X | X | X | | X | X | |
| Jefferson | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mt. Pleas. | X | X | X | X | X | | X | X | X | X | X | X | X | X | X |
| Munday | X | X | X | X | X | X | X | X | X | X | X | X | X | X | |
| Haskell | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur (E) | X | X | X | X | X | | X | X | | X | X | X | X | X | |
| Tyler (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | | X | X | X | X | X | X | X | X | X | | X | X |
| Double Mt. | X | X | X | X | X | | X | | | | | | | | |
| Brazos | X | X | | | X | | | X | X | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | | X | X | | | | | | |
| Guadalupe | | X | | X | X | | X | X | | | | | | | |
| S. Antonio | | | | | | | | | | | | | | | |

CUBE-ROOT-NORMAL DISTRIBUTION - February

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville | | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Goliad | X | X | | X | X | X | X | X | X | X | X | X | X | X | |
| Jefferson | X | X | X | X | X | X | | X | | X | X | | X | X | |
| Longview | | X | X | X | X | X | | | | X | X | | X | X | |
| Mt.Pleas. | | X | | | X | | X | X | X | | | | | | |
| Munday | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Haskell | X | X | X | X | X | X | X | X | X | X | X | | X | X | X |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | X | X | X | X | X | X | | X | X | X | X | X | X |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | | | | | X | X | X | X | | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | | | X | | | | | | | | |
| Brazos | X | X | X | X | X | | X | X | X | | | | | | |
| Big Sandy | X | X | X | X | X | | X | X | | | | | | | |
| Sabine | X | X | X | | | | X | X | | | | | | | |
| Guadalupe | X | X | X | X | | | X | | | | | | | | |
| S.Antonio | X | X | X | X | | | | | | | | | | | |

CUBE-ROOT-NORMAL DISTRIBUTION - March

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | | | X | X | | X | X | X | X | X | X |
| Beeville | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Goliad | X | X | X | | | | X | X | | X | X | | X | X | |
| Jefferson | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | X | X | X | X | | | | | | | | X | |
| Munday | X | X | X | X | X | | | X | | X | | | X | | X |
| Haskell | X | X | | | X | | | | | | | X | | | X |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur (E) | | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Tyler (E) | X | X | X | X | X | X | X | X | X | X | X | X | | X | X |
| Beeville (E) | X | X | | X | X | X | X | X | X | X | X | X | X | X | |
| Double Mt. | X | X | | | | | | | | | | | | | |
| Brazos | | X | | | | | | | | | | | | | |
| Big Sandy | X | X | X | X | X | X | | | | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | | | | | | | |
| Guadalupe | X | X | X | X | X | | X | X | X | | | | | | |
| S.Antonio | X | X | X | X | X | X | | X | X | | | | | | |

CUBE-ROOT-NORMAL DISTRIBUTION - April

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Goliad | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Jefferson | | X | | | X | | | X | | | X | | | X | |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | | X | X | X | X | X | | X | X | | X | X | |
| Munday | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| Haskell | | X | | X | X | | X | X | | X | X | | X | X | |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | | X | X | | X | X | | X | X | | X | X | |
| Spur (E) | X | X | | X | X | X | | X | X | | X | X | | X | |
| Tyler (E) | X | X | X | | X | | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | X | | X | | | | | | | | |
| Brazos | X | X | X | X | X | X | X | | | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | | | | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | X | X | | | | | | |
| S.Antonio | X | X | X | | | | | | | | | | | | |

CUBE-ROOT-NORMAL DISTRIBUTION - May

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | | X | | X | X | | X | X | | X | X | X | X | X | X |
| Beeville | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Goliad | X | X | X | X | X | X | X | X | X | | X | X | | X | X |
| Jefferson | X | X | X | X | X | X | X | X | | X | X | X | X | X | X |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | | X | X |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Munday | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Haskell | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Spur | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Aspermont | X | X | X | X | X | | | | | | | | | | |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | | X | | X | X | | X | X | | X | X | | X | X | |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Double Mt. | | X | | X | X | X | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | X | X | | | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | | | | | | | | |
| S.Antonio | X | X | X | X | X | X | X | X | X | | | | | | |

CUBE-ROOT-NORMAL DISTRIBUTION - June

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| STATION | | | | | | | | | | | | | | | |
| Victoria | | | | | | | X | | | X | | | X | | |
| Beeville | | | | X | X | | | | | | | | X | | |
| Goliad | | X | | X | X | | X | X | | X | | | X | | |
| Jefferson | X | X | | X | X | | X | X | | X | X | | X | X | |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Munday | X | X | X | X | X | X | X | X | | X | X | X | X | X | X |
| Haskell | X | X | | X | X | | | | | X | | | X | | |
| Spur | X | X | X | X | | | X | | | X | | | X | | |
| Aspermont | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Spur (E) | | X | | X | X | | X | X | | X | | | X | X | |
| Tyler (E) | X | X | X | X | X | | X | X | | | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | | X | X | | | X | | | X | |
| Double Mt. | X | X | X | X | X | X | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | X | X | X | X | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | | | | | | | |
| Sabine | X | X | X | X | X | | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | X | X | | | | | | |
| S.Antonio | X | X | X | X | X | X | X | X | X | | | | | | |

CUBE-ROOT-NORMAL DISTRIBUTION - July

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | | X | X | X | X | X | X |
| Beeville | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Goliad | X | X | | X | X | | X | X | | X | X | | X | X | |
| Jefferson | | X | | | X | | X | X | X | X | X | X | X | X | X |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Munday | X | X | X | X | X | | X | X | | X | X | | X | X | X |
| Haskell | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur | X | X | X | X | X | | X | | | X | | | X | | X |
| Aspermont | X | X | X | X | X | | X | X | | X | X | X | X | X | X |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Tyler (E) | X | X | X | X | X | | | X | | | X | X | X | X | X |
| Beeville (E) | | X | | X | X | X | X | X | | X | X | | | X | |
| Double Mt. | X | X | X | X | X | X | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | X | X | X | X | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | | | | | | | |
| Guadalupe | X | X | X | X | X | X | | | | | | | | | |
| S.Antonio | X | X | | X | X | | | | | | | | | | |

CUBE-ROOT-NORMAL DISTRIBUTION - August

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Beeville | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Goliad | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Jefferson | X | X | X | X | X | | X | X | | X | X | | X | X | |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | | | X | | |
| Munday | | X | | | X | | | X | | X | X | X | X | X | X |
| Haskell | X | X | | X | X | | | X | | X | X | X | X | X | X |
| Spur | | X | | X | X | | | X | | X | X | | X | X | X |
| Aspermont | | X | | | X | | | X | | X | X | X | X | X | X |
| Spur (E) | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Tyler (E) | X | X | X | X | X | | X | X | | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | X | X | X | X | X | | | | | | |
| Brazos | | X | | X | X | | X | X | X | | | | | | |
| Big Sandy | X | X | X | X | X | | X | X | | | | | | | |
| Sabine | X | X | | X | X | | X | X | | | | | | | |
| Guadalupe | X | X | | X | X | X | X | X | X | | | | | | |
| S.Antonio | | | | | | | | | | | | | | | |

CUBE-ROOT-NORMAL DISTRIBUTION - September

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test<br>STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | X | X | X | X | | | |
| Beeville | | | | | X | | | | | | X | | X | X | |
| Goliad | | X | | X | X | | X | X | | X | X | | X | X | |
| Jefferson | X | X | X | | X | | X | X | | | X | | | X | |
| Longview | X | X | X | | X | | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | X | X | X | | X | X | X | X | X | X | | X | X |
| Munday | X | X | X | X | X | | X | X | X | X | X | X | X | X | X |
| Haskell | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur | X | X | | X | X | | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | X | X | X | | X | X | X | X | X | X | X | X | X |
| Spur (E) | | X | | X | X | | X | X | | X | X | | X | X | |
| Tyler (E) | X | X | X | X | X | | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | | X | X | | X | X | | | | | | | |
| Brazos | X | X | X | X | X | X | X | X | X | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | | X | | X | X | | X | X | | | | | | | |
| S.Antonio | | | | | | | X | | | | | | | | |

CUBE-ROOT-NORMAL DISTRIBUTION - October

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville | X | X | X | X | X | | X | X | | X | X | | X | X | |
| Goliad | X | X | X | X | X | | X | X | | X | X | | X | X | |
| Jefferson | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Longview | X | X | | | X | X | | X | X | | X | X | | X | X |
| Mt.Pleas. | X | X | | X | X | X | | X | | | X | | | X | |
| Munday | X | X | | X | X | | X | X | | X | X | | X | X | |
| Haskell | X | X | X | | X | | | X | | | X | | | X | X |
| Spur | X | X | X | X | X | X | | X | | X | X | | | X | |
| Aspermont | X | X | X | X | X | X | X | X | X | | X | X | | X | |
| Spur (E) | X | X | X | X | X | | | X | | | X | | | X | |
| Tyler (E) | X | X | | X | X | X | X | X | X | X | X | X | X | X | |
| Beeville (E) | | X | | | X | | X | X | | X | X | | X | X | |
| Double Mt. | X | X | | X | X | | X | X | X | | | | | | |
| Brazos | X | X | | X | X | X | X | X | X | | | | | | |
| Big Sandy | X | X | X | | | | | | | | | | | | |
| Sabine | | X | | X | X | X | X | | X | | | | | | |
| Guadalupe | | X | | X | X | | X | | | | | | | | |
| S.Antonio | X | X | | X | X | | X | | | | | | | | |

CUBE-ROOT-NORMAL DISTRIBUTION - November

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Beeville | X | X | | X | X | | X | X | | X | X | | X | X | |
| Goliad | X | X | | X | X | | X | X | | X | X | | X | X | |
| Jefferson | X | X | X | X | X | | X | X | X | X | X | | X | X | |
| Longview | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | | X | X | X |
| Munday | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Haskell | X | X | X | X | X | X | X | X | X | X | X | X | X | | X |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | | X | | X | X | | X | X | | X | X | | X | X | |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | X | | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | | X | X | X | | | | | | |
| Big Sandy | X | X | X | | | | | | | | | | | | |
| Sabine | X | X | | | | | | | | | | | | | |
| Guadalupe | X | X | | X | X | | X | X | | | | | | | |
| S.Antonio | X | X | | X | X | X | X | | | | | | | | |

CUBE-ROOT-NORMAL DISTRIBUTION - December

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| STATION | | | | | | | | | | | | | | | |
| Victoria | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville | X | X | X | X | X | | X | X | | X | X | | X | X | |
| Goliad | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Jefferson | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Longview | | X | | X | X | X | | X | X | | X | | | X | |
| Mt.Pleas. | X | X | X | X | X | | X | X | | X | X | | X | X | |
| Munday | | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Haskell | | X | | X | X | | X | X | | X | X | | X | X | X |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | | X | | | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | X | X | X | X | | | | | | |
| Big Sandy | X | X | X | X | X | | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | X | | | | | | | |
| S.Antonio | X | X | X | X | X | X | X | | | | | | | | |

LOG-NORMAL DISTRIBUTION - January

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Goliad | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Jefferson | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Longview | X | X | X | X | X | X | X | X | | X | | | X | | |
| Mt.Pleas. | X | X | | X | X | | X | X | | X | X | | X | X | |
| Munday | X | X | X | X | X | X | X | X | | X | | | X | | |
| Haskell | X | X | X | X | X | X | X | X | X | X | X | X | X | | |
| Spur | X | X | X | X | X | X | X | X | X | X | | X | X | | X |
| Aspermont | X | X | X | X | X | X | X | X | X | X | | X | X | | X |
| Spur (E) | X | X | X | X | X | | X | X | | X | X | | X | X | |
| Tyler (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | | X | X | X | X | X | X | X | X | X | | X | X |
| Double Mt. | X | X | X | | X | X | | X | X | | | | | | |
| Brazos | X | X | X | | | | | | | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | | X | X | | | | | | |
| Guadalupe | X | X | | X | X | | X | X | | | | | | | |
| S.Antonio | | X | | X | | | X | | | | | | | | |

LOG-NORMAL DISTRIBUTION - February

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | | X | | X | X | | X | | | X | | X | X | | X |
| Beeville | | | | | | | X | | | X | | | X | | |
| Goliad | | | | X | X | | X | | X | X | X | X | | | |
| Jefferson | X | X | X | X | X | X | | | | | | | | | |
| Longview | | X | | X | X | | | | | | | | | | |
| Mt.Pleas. | | X | | | X | | | X | X | | | | | | |
| Munday | X | X | X | X | X | | X | X | | X | | | X | | |
| Haskell | X | X | X | X | X | X | X | X | X | X | | | X | | |
| Spur | X | X | | | | | X | | X | X | | X | X | | X |
| Aspermont | X | X | X | X | X | | X | | | X | | X | X | | X |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | | | | | X | X | | X | X | X | X | X | X | | |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | X | X | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | X | X | X | | | | | | | |
| Big Sandy | X | X | X | X | X | | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | X | X | | | | | | |
| S.Antonio | X | X | X | X | X | | X | X | | | | | | | |

LOG-NORMAL DISTRIBUTION - March

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | | X | X | X | X | X | | X | | |
| Beeville | X | X | X | X | X | | X | X | | X | | | X | | |
| Goliad | X | X | X | X | X | | X | X | X | X | X | X | X | X | X |
| Jefferson | X | X | X | X | X | X | X | X | X | X | X | X | X | | |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | | X | X | X | | X | | | X | | | X | |
| Munday | X | X | X | | | | | | | | | | | | |
| Haskell | X | X | X | | | | | | | | | | | | |
| Spur | X | X | X | X | X | X | X | X | X | X | | X | X | | X |
| Aspermont | X | X | X | X | X | X | X | | X | X | | X | | | |
| Spur (E) | | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | X | X | X | X | X | X | X | X | X | X | X | X | | X | X |
| Beeville (E) | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | X | X | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | X | | | | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | X | X | | | | | | |
| S.Antonio | X | X | X | X | X | X | X | X | X | | | | | | |

LOG-NORMAL DISTRIBUTION -April

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beéville | X | X | | X | X | | X | | | X | | | X | | |
| Goliad | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Jefferson | X | X | X | X | X | X | X | X | X | X | X | | | X | |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Munday | | X | | | | | | | | | | | | | |
| Haskell | | X | | | | | | | | | | | | | |
| Spur | X | X | | X | X | X | X | X | X | | | X | | | X |
| Aspermont | | X | | X | | | | | | | | | | | |
| Spur (E) | | X | | X | X | | | X | | | X | | X | X | |
| Tyler (E) | X | X | X | | X | | X | X | X | X | X | X | X | X | X |
| Beeville (E) | | X | | X | X | | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | X | X | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | X | X | X | | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | X | X | | | | | | |
| S.Antonio | X | X | X | | X | | X | X | X | | | | | | |

LOG-NORMAL DISTRIBUTION - May

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| STATION | | | | | | | | | | | | | | | |
| Victoria | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville | X | X | X | X | X | X | X | X | X | X | X | X | | | |
| Goliad | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Jefferson | X | X | X | X | X | X | X | X | X | X | | | X | | |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | | X | X |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Munday | X | X | X | X | X | X | X | X | | X | X | | X | X | |
| Haskell | X | X | X | X | X | X | | | | | | | | | |
| Spur | X | X | X | X | X | X | | | | | | | | | |
| Aspermont | | X | | | | | | | | | | | | | |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | | X | | X | X | | X | X | | X | X | | X | X | |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Double Mt. | X | X | X | X | X | | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | X | X | X | X | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | X | X | | | | | | |
| S.Antonio | X | X | | X | X | | X | X | | | | | | | |

LOG-NORMAL DISTRIBUTION - June

| Yrs.Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | | | | | | | | | | | | | | | |
| Beeville | | | | | | | | | | | | | | | |
| Goliad | | | | | | | | | | | | | | | |
| Jefferson | X | X | X | | | | | | | | | | | | |
| Longview | X | X | X | X | X | X | X | X | | X | X | X | X | | |
| Mt.Pleas. | X | X | | X | X | X | X | X | X | | | | | | |
| Munday | X | X | X | | | | | | | X | | | | | |
| Haskell | X | X | | | | | | | | | | | | | |
| Spur | X | X | X | | | | | | | | | X | | | |
| Aspermont | X | X | X | X | X | X | X | X | X | | | | | | |
| Spur (E) | | X | | X | X | X | X | X | | X | X | | X | X | |
| Tyler (E) | X | X | X | X | X | X | X | X | X | | X | X | X | X | X |
| Beeville (E) | X | X | | X | X | | X | X | | | X | | X | X | |
| Double Mt. | X | X | X | X | X | X | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | | X | X | | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | | X | X | | | | | | | |
| S.Antonio | X | X | X | X | X | X | X | X | | | | | | | |

LOG-NORMAL DISTRIBUTION - July

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | | X | X | | X | X | | X | X | | X | X | |
| Beeville | | | | X | X | X | X | | X | X | | X | X | | |
| Goliad | | | | | | | | | | | | | | | |
| Jefferson | | X | | | | | X | | | X | | | X | | |
| Longview | X | X | X | X | X | X | X | | | X | | | X | | |
| Mt.Pleas. | X | X | X | X | X | X | X | X | X | | | | | | |
| Munday | X | X | X | | | | X | | | X | | | | | |
| Haskell | X | X | | X | X | X | X | X | X | X | X | X | X | | |
| Spur | X | X | | | | | X | | | X | | | X | | |
| Aspermont | X | X | | X | | | X | | | X | | | X | | |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | X | X | X | X | X | | | X | | | X | X | X | X | X |
| Beeville (E) | | X | | X | X | X | | | | | | | | X | |
| Double Mt. | X | X | X | X | X | | X | X | | | | | | | |
| Brazos | X | X | X | X | X | | X | | | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | | X | X | | | | | | | |
| S.Antonio | X | X | X | X | X | X | X | X | | | | | | | |

LOG-NORMAL DISTRIBUTION - August

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | | X | X | | X | X | | X | | | | | |
| Beeville | | X | | X | X | X | X | | | X | | | | | |
| Goliad | | X | | X | X | X | X | X | | | | | | | |
| Jefferson | X | X | X | | | | | | | | | | | | |
| Longview | X | X | X | X | X | X | X | X | X | X | X | X | | | |
| Mt. Pleas. | X | X | X | X | X | | X | X | | | | | | | |
| Munday | | | | | | | | | | X | | | | | |
| Haskell | X | X | | X | X | X | | | | X | | | X | | |
| Spur | X | X | X | | X | | | | | | | | | | |
| Aspermont | | | | | | | | | | X | | | | | |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | | X | X | |
| Tyler (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | | X | X | X | X | X | |
| Double Mt. | X | X | | X | X | X | X | | | | | | | | |
| Brazos | X | X | | | | | | | | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | | X | | | | | | | | |
| S. Antonio | X | X | | X | X | X | X | X | X | | | | | | |

LOG-NORMAL DISTRIBUTION - September

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | X | X | | | | | |
| Beeville | | X | | | X | X | | X | | | X | | | | |
| Goliad | X | X | | X | X | | | | | | | | | | |
| Jefferson | X | X | X | | | | | | | | | | | | |
| Longview | X | X | X | | | | X | | | | | | | | |
| Mt.Pleas. | X | X | X | | | | | | | | | | | | |
| Munday | X | X | X | | | | X | | | X | | | X | | |
| Haskell | | | | X | | | X | | | X | | | | | |
| Spur | X | X | X | | | | | | | | | | | | |
| Aspermont | X | X | X | | | | X | | | X | | | X | | |
| Spur (E) | | X | | X | X | X | X | X | X | X | X | | X | X | |
| Tyler (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | X | X | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | X | X | X | X | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | | X | | X | X | X | X | X | | | | | | | |
| S.Antonio | | | | X | | | X | | | | | | | | |

LOG-NORMAL DISTRIBUTION - October

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | | | | X | | | | | | | | |
| Beeville | X | X | | | | | | | | | | | | | |
| Goliad | X | X | | | | | | | | | | | | | |
| Jefferson | X | X | | X | X | | X | | | X | | | | | |
| Longview | | | | | | | | | | | | | | | |
| Mt.Pleas. | X | X | | X | X | | | | | | | | | | |
| Munday | X | X | X | | | | | | | | | | | | |
| Haskell | X | X | | | | | | | | | | | | | |
| Spur | X | X | | | | | | | | | | | | | |
| Aspermont | X | X | X | | | | | | | | | | | | |
| Spur (E) | X | X | X | X | X | | | | | | | | | | |
| Tyler (E) | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Beeville (E) | | X | | | | | X | X | | X | X | | X | X | |
| Double Mt. | X | X | X | X | X | X | X | X | X | | | | | | |
| Brazos | X | X | X | X | X | X | X | X | X | | | | | | |
| Big Sandy | X | X | X | | | | X | | | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | X | X | | X | X | X | X | X | X | | | | | | |
| S.Antonio | X | X | | X | X | X | X | X | | | | | | | |

LOG-NORMAL DISTRIBUTION - November

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | | | | | | | | | | |
| Beeville | | X | | X | | | X | | | | | | | | |
| Goliad | | | | X | | | X | | | | | | | | |
| Jefferson | X | X | X | X | | | X | | | X | | | X | | |
| Longview | X | X | X | X | X | | X | | | X | | | X | | |
| Mt.Pleas. | X | X | X | X | X | | X | X | | X | | | X | | |
| Munday | X | X | | X | X | X | X | | X | | | | X | | X |
| Haskell | X | X | X | X | X | X | X | | X | X | | X | X | | X |
| Spur | X | X | X | X | X | X | X | X | X | X | X | X | X | | X |
| Aspermont | X | X | X | X | X | X | X | X | X | X | | X | X | | X |
| Spur (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | | X | | X | X | | X | X | | X | X | X | X | X | |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | X | | X | | | | | | | | |
| Brazos | X | X | X | X | X | X | | | | | | | | | |
| Big Sandy | X | X | X | | X | | | X | | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | X | X | | | X | X | | X | | | | | | | |
| S.Antonio | X | X | X | X | X | X | X | X | X | | | | | | |

LOG-NORMAL DISTRIBUTION - December

| Yrs. Record | 10 | | | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test / STATION | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv | Cornu | Skew | Chauv |
| Victoria | X | X | X | X | X | X | X | X | X | X | X | X | X | | |
| Beeville | X | X | X | X | | | | | | | | | | | |
| Goliad | X | X | | X | X | | | | | | | | | | |
| Jefferson | X | X | X | X | X | | X | X | | X | | | | | |
| Longview | | X | | X | X | | | | | | | | | | |
| Mt.Pleas. | X | X | X | X | | | X | | | X | | | X | | |
| Munday | X | X | | X | X | | X | | | X | | X | X | | X |
| Haskell | | X | | X | | | | | | X | | | X | | |
| Spur | | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Aspermont | | X | | X | X | X | X | | X | X | | X | X | | X |
| Spur (E) | X | X | | X | X | X | X | X | X | X | X | X | X | X | X |
| Tyler (E) | X | X | X | X | X | | X | X | | X | X | X | X | X | X |
| Beeville (E) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Double Mt. | X | X | X | X | X | X | | X | X | | | | | | |
| Brazos | X | X | X | X | X | | X | | | | | | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | | | | |
| Sabine | X | X | X | X | X | X | X | X | X | | | | | | |
| Guadalupe | X | X | X | X | X | X | X | X | X | | | | | | |
| S.Antonio | X | X | X | X | X | X | X | X | | | | | | | |

# APPENDIX B

Results obtained from statistical analyses of sliding 10-, 20-, and 30-yr periods of data for the normal, square-root-normal, cube-root-normal, and log-normal distributions. In all cases, the sliding periods are slid only 10 yr for each new calculation. The numbers listed in the tables signify the following:

X = all data periods conform

1 = for sliding 10 yr the 1st 10 yr period conforms
for sliding 20 yr the 1st 20 yr period conforms
for sliding 30 yr the 1st 30 yr period conforms

2 = for sliding 10 yr the 2nd 10 yr period conforms
for sliding 20 yr the 2nd 20 yr period conforms, etc.

NORMAL DISTRIBUTION - 10 YR PERIOD

| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | 145 | 234 | 1345 | X | 2345 | 2345 | 1245 | X | 1235 | 23 | X | X |
| Beeville | 1345 | 1234 | 1235 | X | 1345 | 1245 | 1245 | 1235 | 245 | X | X | X |
| Goliad | X | 134 | 1345 | X | X | X | 1245 | 1245 | 2345 | 2345 | X | X |
| Jefferson | X | 1245 | 125 | 345 | 1234 | 2345 | X | X | 1345 | X | X | 1245 |
| Longview | 1235 | 245 | 1245 | 145 | 2345 | 134 | X | 45 | X | 1234 | X | 2345 |
| Mt.Pleas. | 1345 | 2345 | 1245 | 2345 | X | X | X | 1234 | 1245 | 125 | X | X |
| Munday | 345 | X | X | X | X | X | X | 1345 | 135 | X | 1345 | 123 |
| Haskell | 345 | 1345 | X | 23 | X | X | X | 34 | X | 14 | X | 23 |
| Spur | 1345 | 1345 | X | 134 | X | X | 2345 | 2345 | 25 | 125 | X | 1234 |
| Aspermont | 1345 | 1345 | 234 | 12 | 1245 | X | X | 234 | X | 1245 | X | 34 |
| Spur (E) | 1245 | X | 2345 | 123 | 1245 | X | X | X | X | 1235 | X | 1245 |
| Tyler (E) | X | 2345 | X | 1345 | 1345 | 1234 | 1245 | 1235 | X | X | 2345 | X |
| Beeville (E) | 2345 | X | X | X | X | 135 | 1234 | X | X | 345 | 1235 | 1235 |
| Double Mt. | 1 | 1 | | 12 | 23 | 12 | 13 | X | 3 | 2 | 13 | 3 |
| Brazos | 2 | 1 | | 2 | 23 | 23 | X | 23 | 13 | | 13 | X |
| Big Sandy | 12 | 13 | 12 | 12 | X | X | X | 13 | X | 1 | 1 | X |
| Sabine | X | 13 | 1 | 12 | X | 13 | X | | X | 2 | | X |
| Guadalupe | 3 | 13 | 13 | X | 12 | 13 | X | X | 23 | 3 | | 12 |
| S.Antonio | 3 | 13 | X | X | X | X | 12 | X | 23 | 2 | 1 | 12 |

NORMAL DISTRIBUTION - 20 YR PERIOD

| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | 1 | X | 34 | 234 | 23 | 234 | 14 | 14 | 34 | 2 | X | X |
| Beeville | | 13 | 134 | 34 | 234 | X | 14 | 123 | 34 | 234 | 123 | 24 |
| Goliad | 12 | 3 | 34 | 234 | 123 | 134 | 14 | 4 | | 24 | 12 | X |
| Jefferson | X | 14 | 1 | 3 | 134 | 234 | X | 14 | 3 | 234 | 14 | 134 |
| Longview | 12 | X | 14 | 4 | 134 | X | 4 | 4 | 234 | | X | 234 |
| Mt.Pleas. | X | 234 | 14 | 234 | 12 | 124 | X | X | 14 | 4 | X | X |
| Munday | 34 | 123 | 234 | 12 | 12 | X | X | 3 | 12 | 2 | 34 | 2 |
| Haskell | 34 | 123 | 123 | 2 | X | X | 134 | 3 | 124 | 1 | X | 2 |
| Spur | 34 | 23 | 123 | 34 | 12 | X | 23 | 234 | | 1 | 134 | 23 |
| Aspermont | 34 | 3 | 23 | 12 | 124 | 234 | 123 | | 1 | 1 | 123 | 2 |
| Spur (E) | 134 | X | 34 | 134 | 134 | 134 | X | 134 | 134 | 134 | 134 | X |
| Tyler (E) | X | 24 | X | 234 | X | 134 | 4 | X | X | X | X | X |
| Beeville (E) | X | X | X | X | 134 | 34 | 123 | X | X | 234 | 123 | X |
| Double Mt. | | | | | | 1 | | | | | | |
| Brazos | | | | | | 1 | 2 | | | | | |
| Big Sandy | 2 | | 1 | | X | 2 | | | X | | | 2 |
| Sabine | 2 | | | | X | | 1 | | X | | | 1 |
| Guadalupe | | | 2 | X | | | | 2 | | | | |
| S.Antonio | | | 1 | | | | | 1 | | | | |

NORMAL DISTRIBUTION - 30 YR PERIOD

| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | | X | 3 | | | 23 | | | 3 | | X | X |
| Beeville | | | 23 | | 13 | X | | | 3 | 1 | 12 | |
| Goliad | 1 | | | 3 | 23 | 13 | | | | 2 | 1 | 1 |
| Jefferson | 13 | | | | 2 | 23 | 13 | | | | | |
| Longview | 12 | X | | | 1 | 13 | 3 | | 3 | | X | 3 |
| Mt.Pleas. | 1 | X | | 3 | | | 12 | X | 1 | | 12 | X |
| Munday | 3 | 1 | 23 | | 2 | X | | | | | 13 | 1 |
| Haskell | 3 | | 12 | 1 | X | 13 | 3 | | 12 | | 1 | 1 |
| Spur | 3 | | 2 | | 12 | X | 12 | | | | | |
| Aspermont | 3 | | 2 | | 12 | 23 | 2 | | | | 1 | 1 |
| Spur (E) | X | X | 13 | 3 | 13 | 3 | 13 | 13 | 13 | 3 | 1 | 1 |
| Tyler (E) | X | 12 | X | X | X | X | 3 | X | X | X | X | X |
| Beeville (E) | 13 | X | X | X | 13 | 3 | X | X | X | X | X | X |
| Double Mt. | | | | | | | | | | | | |
| Brazos | | | | | | | | | | | | |
| Big Sandy | | | | | | | | | X | | | |
| Sabine | | | | | | | | | X | | | |
| Guadalupe | | | | | | | | X | | | | |
| S.Antonio | | | | | | | | | | | | |

SQUARE-ROOT-NORMAL DISTRIBUTION - 10 YR PERIOD

| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | X | 2345 | 1235 | X | 2345 | 235 | 1245 | 1345 | 123 | 1234 | X | X |
| Beeville | X | 1234 | 1235 | X | 1345 | 2345 | X | X | 245 | X | X | X |
| Goliad | X | 1234 | 1345 | X | 1345 | 2345 | 1245 | 1245 | 2345 | X | X | X |
| Jefferson | X | X | 125 | 345 | 1234 | 2345 | 2345 | X | X | X | X | X |
| Longview | 1235 | 245 | 1245 | X | X | X | 1345 | 2345 | X | X | X | X |
| Mt.Pleas. | X | 235 | 1245 | X | X | X | X | 1234 | 1245 | 1245 | X | X |
| Munday | 1345 | 1345 | 1245 | X | X | X | 1234 | 1345 | X | X | X | 2345 |
| Haskell | X | X | X | 1234 | 1245 | X | X | 1345 | X | 1245 | X | 2345 |
| Spur | X | 1345 | X | X | 1245 | X | X | 2345 | X | X | X | 1234 |
| Aspermont | X | 1345 | X | 1245 | 1245 | X | X | 234 | X | 1245 | X | 34 |
| Spur (E) | 14 | X | 2345 | 23 | 1245 | X | X | X | X | 1235 | X | X |
| Tyler (E) | X | 2345 | X | 1345 | 1345 | 1234 | 1245 | 1235 | X | 1234 | 2345 | X |
| Beeville (E) | 2345 | X | X | X | 1235 | 135 | 1234 | X | X | 345 | 1235 | 1235 |
| Double Mt. | 12 | 13 | | 12 | 23 | 12 | 13 | X | X | X | 13 | 23 |
| Brazos | X | X | 3 | X | X | X | X | 23 | X | X | X | X |
| Big Sandy | 12 | X | 12 | X | X | X | X | X | X | 12 | 13 | X |
| Sabine | X | 13 | 13 | X | X | X | X | 13 | X | 23 | 2 | X |
| Guadalupe | 3 | 13 | X | X | 12 | X | X | X | 23 | 23 | 23 | X |
| S.Antonio | 3 | 13 | X | X | X | X | 13 | X | 23 | 2 | 12 | 12 |

SQUARE-ROOT-NORMAL DISTRIBUTION - 20 YR PERIOD

| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | X | X | 234 | X | X | X | X | 134 | 123 | 123 | X | X |
| Beeville | X | 123 | 1234 | X | X | X | X | X | 234 | X | X | X |
| Goliad | X | X | 34 | X | 124 | X | X | X | X | X | X | X |
| Jefferson | X | 124 | 12 | 23 | X | X | X | X | X | X | X | X |
| Longview | 12 | X | 124 | X | X | X | X | X | 3 | 234 | X | X |
| Mt.Pleas. | X | 2 | 14 | X | 123 | 124 | X | X | 124 | 134 | X | X |
| Munday | X | X | X | X | X | X | X | 124 | X | X | X | X |
| Haskell | X | X | 234 | 123 | X | X | X | 34 | 134 | 14 | X | X |
| Spur | X | X | X | X | 124 | X | X | X | X | X | X | X |
| Aspermont | X | X | X | 124 | 124 | X | X | 234 | X | 124 | X | 134 |
| Spur (E) | 134 | X | 34 | 13 | 134 | 134 | X | X | 123 | 134 | 134 | X |
| Tyler (E) | X | 24 | X | 234 | X | 134 | 14 | 123 | X | X | X | X |
| Beeville (E) | X | X | X | X | X | 134 | 123 | X | X | 234 | X | X |
| Double Mt. | | | | | X | X | X | X | | 2 | 2 | 2 |
| Brazos | 2 | X | | | X | X | X | 2 | X | | 2 | X |
| Big Sandy | X | 2 | 1 | X | X | X | X | X | X | | | X |
| Sabine | X | | X | 1 | X | X | 1 | | X | | | X |
| Guadalupe | 2 | | X | X | 1 | X | 1 | X | 2 | | 2 | 1 |
| S.Antonio | | | 1 | | X | X | 1 | X | | 1 | 1 | 1 |

SQUARE-ROOT-NORMAL DISTRIBUTION - 30 YR PERIOD

| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | 13 | .X | 23 | X | X | X | X | 3 | X | X | X | X |
| Beeville | 1 | 12 | 123 | X | X | X | X | X | 23 | X | X | X |
| Goliad | 23 | X | 23 | X | 12 | 123 | X | X | X | X | X | X |
| Jefferson | X | X | | | X | X | X | X | 13 | X | X | X |
| Longview | 12 | 23 | X | X | X | X | X | X | X | 23 | X | 23 |
| Mt.Pleas. | X | X | | 23 | 12 | X | X | X | 13 | 13 | X | X |
| Munday | X | X | X | X | X | X | X | X | X | X | X | X |
| Haskell | X | X | X | X | X | X | X | 23 | X | X | 23 | X |
| Spur | 12 | 12 | X | X | X | 23 | X | X | X | X | X | X |
| Aspermont | X | X | X | X | 12 | X | 12 | X | X | 1 | 23 | X |
| Spur (E) | X | X | 13 | 3 | 13 | 3 | X | X | X | | 13 | X |
| Tyler (E) | X | 12 | X | X | X | X | 23 | X | X | X | X | X |
| Beeville (E) | 13 | X | X | X | 13 | | 3 | X | X | X | X | X |
| Double Mt. | | | | | | X | X | X | | | | |
| Brazos | | | | | | X | X | X | | | X | X |
| Big Sandy | X | X | | | X | | X | X | X | | | X |
| Sabine | | | | | X | X | | | X | | | X |
| Guadalupe | | | X | X | | X | | X | | | | |
| S.Antonio | | | | | | X | | X | | | | |

CUBE-ROOT-NORMAL DISTRIBUTION - 10 YR PERIOD

| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | X | 2345 | 1235 | X | 2345 | 235 | 1245 | X | 123 | 123 | X | X |
| Beeville | X | 2345 | 1235 | X | X | 2345 | X | X | 245 | X | X | X |
| Goliad | X | 1234 | 1345 | X | 1345 | 2345 | 1245 | 1245 | 2345 | X | X | X |
| Jefferson | X | X | 1235 | 2345 | 1234 | X | 2345 | X | X | X | X | X |
| Longview | 1235 | 245 | 1245 | X | X | X | 1345 | X | X | X | X | 2345 |
| Mt.Pleas. | X | 235 | 1245 | X | X | X | X | 1234 | 1245 | 1245 | X | X |
| Munday | X | 1345 | 125 | X | 1245 | X | 1234 | 1345 | X | X | X | 245 |
| Haskell | 1234 | X | X | 234 | 1245 | X | X | 1245 | 1234 | 1234 | X | 2345 |
| Spur | 1234 | 1345 | 1245 | X | 1245 | 1235 | X | 2345 | X | X | X | X |
| Aspermont | X | 1345 | X | 1245 | 1245 | X | X | 234 | X | 125 | 1235 | 2345 |
| Spur (E) | 134 | X | 2345 | 3 | 1245 | X | X | X | 2345 | 1235 | X | X |
| Tyler (E) | X | 2345 | X | 1345 | 345 | 1234 | 1245 | 1235 | X | 1234 | 2345 | X |
| Beeville (E) | 2345 | X | X | X | 1235 | 135 | 1234 | X | X | 345 | 1235 | 1235 |
| Double Mt. | X | 13 | 13 | 12 | 23 | 12 | X | X | X | X | X | X |
| Brazos | X | X | 3 | X | X | X | X | 23 | X | X | X | X |
| Big Sandy | 12 | X | 12 | X | X | X | X | X | X | X | 13 | X |
| Sabine | X | 13 | 13 | X | X | X | X | X | X | 23 | 12 | X |
| Guadalupe | 3 | 13 | X | X | 12 | X | X | X | 23 | 23 | X | X |
| S.Antonio | 3 | 13 | X | X | X | X | 13 | X | 23 | 12 | X | 12 |

CUBE-ROOT-NORMAL DISTRIBUTION - 20 YR PERIOD

| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | X | X | 23 | X | X | X | X | 134 | 123 | 123 | X | X |
| Beeville | X | X | X | X | X | X | X | X | 234 | X | X | X |
| Goliad | X | X | 34 | X | 124 | X | X | X | X | X | X | X |
| Jefferson | X | 124 | 12 | 23 | 1234 | X | 234 | X | X | X | X | X |
| Longview | 12 | 134 | 124 | X | X | X | X | X | 23 | 234 | X | X |
| Mt.Pleas. | X | 2 | 14 | X | X | 124 | X | X | X | 14 | X | X |
| Munday | X | 124 | 134 | 123 | X | X | X | X | X | X | X | X |
| Haskell | X | X | 234 | 123 | X | X | X | 134 | X | 134 | X | X |
| Spur | X | X | X | X | 124 | 123 | X | X | X | X | X | 134 |
| Aspermont | X | X | X | 124 | 14 | X | X | 234 | X | 14 | X | 134 |
| Spur (E) | 134 | X | 34 | 123 | 134 | X | X | X | 123 | 134 | 134 | X |
| Tyler (E) | X | 24 | X | 234 | X | 134 | 14 | 123 | X | X | X | X |
| Beeville (E) | X | X | X | X | 123 | 134 | 123 | X | X | 234 | X | X |
| Double Mt. | 1 | 2 | | 1 | X | X | X | X | X | X | X | 2 |
| Brazos | 2 | X | 2 | X | X | X | X | X | X | X | X | X |
| Big Sandy | X | X | 1 | X | X | X | X | X | X | | | X |
| Sabine | X | 2 | X | 1 | X | X | X | X | X | X | | X |
| Guadalupe | X | | X | X | 1 | X | 1 | X | X | X | X | X |
| S.Antonio | | | 1 | 2 | X | X | 1 | X | 2 | 1 | 1 | 1 |

CUBE-ROOT-NORMAL DISTRIBUTION - 30 YR PERIOD

| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | X | X | X | X | X | X | X | 23 | 12 | X | X | X |
| Beeville | X | X | X | X | X | 23 | X | X | 23 | X | X | X |
| Goliad | 23 | X | X | X | 12 | X | X | X | X | X | X | X |
| Jefferson | X | 23 | 12 | 2 | 123 | X | X | X | 13 | X | X | X |
| Longview | 12 | 23 | X | X | X | X | X | X | 12 | 23 | X | 2 |
| Mt.Pleas. | X | 1 | | X | X | X | X | 12 | 13 | 3 | X | X |
| Munday | X | X | 23 | X | X | X | X | X | X | X | X | X |
| Haskell | X | X | 23 | X | 13 | 23 | X | 23 | X | X | X | X |
| Spur | X | 12 | X | X | 13 | 2 | X | X | X | X | X | X |
| Aspermont | X | X | X | X | 1 | X | X | X | X | 1 | 23 | X |
| Spur (E) | X | X | 13 | 3 | 13 | 3 | X | X | X | | 13 | X |
| Tyler (E) | X | 12 | X | X | X | X | 23 | X | X | X | X | X |
| Beeville (E) | 13 | X | X | X | 13 | | 3 | X | X | X | X | X |
| Double Mt. | | | | | X | X | X | X | X | X | X | X |
| Brazos | X | X | | | | X | X | X | X | | X | X |
| Big Sandy | X | X | | X | X | X | X | X | X | | | X |
| Sabine | | X | X | | X | X | X | X | X | | | X |
| Guadalupe | X | | X | X | | X | | X | X | | X | X |
| S.Antonio | | | | | X | X | | X | | | | |

LOG - NORMAL DISTRIBUTION - 10 YR PERIOD

| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | X | 2345 | 1235 | X | X | 2345 | X | 1234 | 123 | 13 | 124 | X |
| Beeville | X | 2345 | 1235 | X | X | 24 | 2345 | 2345 | 245 | 1234 | 2345 | 1245 |
| Goliad | X | 234 | X | X | 1345 | 2345 | 245 | 2 | X | 1345 | 345 | 1245 |
| Jefferson | X | 1245 | 13 | X | 1234 | 135 | 2345 | 13 | X | X | X | 1234 |
| Longview | 1235 | 245 | 1245 | X | X | X | 14 | X | X | 345 | 1345 | 2345 |
| Mt.Pleas. | X | 235 | 1245 | 1245 | X | 125 | 1235 | 1234 | 1245 | 1245 | 1245 | 1345 |
| Munday | X | 134 | 125 | 234 | 145 | X | 1234 | 345 | X | X | 1235 | 245 |
| Haskell | 1234 | X | 12 | 234 | 1245 | X | 1235 | 1245 | 23 | 1234 | 1235 | 234 |
| Spur | 134 | 1345 | 1245 | 1235 | 145 | 1235 | 1345 | 145 | 134 | 1234 | X | 2345 |
| Aspermont | 1234 | 1345 | 123 | 25 | 245 | X | 1235 | 234 | 1234 | 1235 | 1235 | 2345 |
| Spur (E) | 134 | X | 2345 | 3 | 1245 | X | X | X | 2345 | 1235 | X | X |
| Tyler (E) | X | 2345 | X | 1345 | 345 | 1234 | 1245 | 1235 | X | 1234 | 2345 | X |
| Beeville (E) | 2345 | X | X | X | 1235 | 135 | 1234 | X | X | 345 | 1235 | 1235 |
| Double Mt. | X | X | X | X | X | 12 | 13 | 13 | X | X | X | X |
| Brazos | 12 | 12 | 12 | X | X | X | X | X | X | X | X | X |
| Big Sandy | 12 | X | 12 | X | X | X | X | X | X | X | 13 | X |
| Sabine | X | X | X | X | X | X | X | X | X | X | X | X |
| Guadalupe | X | 13 | X | X | 12 | X | X | X | 23 | 23 | X | X |
| S.Antonio | 3 | 13 | X | X | X | X | X | X | 23 | X | X | X |

LOG - NORMAL DISTRIBUTION - 20 YR PERIOD

| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | X | X | 12 | X | X | 2 | X | 12 | 12 | 3 | 1 | 123 |
| Beeville | X | 234 | 12 | 124 | 123 | | X | 134 | 24 | 3 | 24 | 4 |
| Goliad | 34 | 123 | 124 | X | X | 234 | 4 | 12 | 14 | 34 | 34 | 14 |
| Jefferson | X | 14 | 12 | 12 | X | | 234 | | 34 | 123 | 34 | X |
| Longview | 12 | 14 | 124 | X | 234 | X | 1 | 123 | 2 | 34 | X | 13 |
| Mt.Pleas. | X | 2 | 14 | X | X | 12 | 12 | 12 | 3 | 1 | X | 34 |
| Munday | X | X | | 2 | 124 | 34 | 23 | 3 | 34 | 34 | | 124 |
| Haskell | X | X | 2 | 23 | 14 | 34 | 123 | 134 | 2 | 3 | 12 | 34 |
| Spur | 123 | 34 | 12 | 12 | 14 | | 3 | 4 | 3 | 3 | 234 | X |
| Aspermont | 123 | X | 12 | 2 | 4 | 12 | | 234 | 234 | | 124 | 134 |
| Spur (E) | 134 | X | 234 | 23 | 134 | X | X | X | 123 | 14 | 134 | X |
| Tyler (E) | X | 24 | X | 234 | X | 134 | 14 | 123 | X | X | X | X |
| Beeville (E) | X | X | 124 | X | 12 | 14 | 14 | X | X | 34 | X | X |
| Double Mt. | 2 | X | X | X | X | X | X | 1 | X | X | X | X |
| Brazos | | X | 1 | X | X | 1 | 1 | | X | 2 | X | X |
| Big Sandy | X | X | 1 | X | X | X | X | X | X | 2 | 2 | X |
| Sabine | X | X | 1 | 1 | X | X | X | X | X | X | X | X |
| Guadalupe | X | X | X | X | X | 1 | 1 | X | X | X | 2 | X |
| S.Antonio | 2 | 1 | X | 2 | X | X | X | X | X | X | X | X |

LOG - NORMAL DISTRIBUTION - 30 YR PERIOD

| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Victoria | X | 23 | 1 | X | X | | X | 1 | 1 | | | 12 |
| Beeville | X | 3 | 12 | | 12 | | | | | | | 3 |
| Goliad | 23 | 2 | 12 | X | X | 23 | | 1 | | 3 | 3 | |
| Jefferson | X | | 12 | 12 | 1 | | 23 | | 3 | 2 | 3 | X |
| Longview | 1 | | X | X | X | 12 | | 12 | | X | 3 | |
| Mt.Pleas. | X | | 3 | X | X | 1 | 1 | 1 | | | 12 | 3 |
| Munday | X | 1 | | | X | 3 | | | | 3 | | 3 |
| Haskell | X | 1 | | 2 | | | 12 | | | | | 3 |
| Spur | 1 | 23 | 12 | | | | | | | | 12 | 13 |
| Aspermont | 12 | 23 | | | | 1 | | 23 | | | | 23 |
| Spur (E) | X | X | 13 | 3 | 13 | X | X | X | X | | 13 | X |
| Tyler (E) | X | 2 | X | X | X | X | 23 | X | X | X | X | X |
| Beeville (E) | 13 | X | X | X | 1 | 1 | | X | X | X | X | X |
| Double Mt. | | X | X | X | X | X | X | | X | X | | |
| Brazos | | X | | X | X | X | | | X | | | |
| Big Sandy | X | X | X | X | X | X | X | X | X | | | X |
| Sabine | | X | X | X | X | X | X | X | X | X | X | X |
| Guadalupe | X | X | X | X | X | X | X | | X | X | | X |
| S.Antonio | | X | X | X | X | X | X | X | | X | X | X |